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NUCLEAR SCIENCE ABSTRACTS

Nuclear Science Abstracts is issued twice monthly throughout the calendar year by the Atomic Energy Commission. It is intended primarily to serve scientists and engineers working within the Atomic Energy Project by abstracting as completely and as promptly as possible the literature of nuclear science and engineering. It covers not only the unclassified and declassified research reports of the Atomic Energy Commission and its contractors, but also material in its field of interest which appears in technical and scientific journals and unpublished research reports of government agencies, universities, and industrial research establishments.

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Each issue of volume 7(1953) contains an author index to abstracts in that issue and a supplement to the Numerical Index of Reports. Subject and author indexes, as well as a cumulation of the Numerical Index of Reports, covering three-month periods are issued as supplements to the sixth, twelfth, and eighteenth issues. The 24th issue will be the annual index for the year, superseding the three index supplements mentioned above.

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GUIDE TO ABSTRACT WRITING

1. *Purpose.* It is very important that a paper be accompanied by an abstract, preferably appearing at the beginning. This abstract is not part of the paper—it is an adjunct intended to convey briefly the content of the paper, to draw attention to all new information and to the main conclusions. It should be directly informative, not merely indicative.

2. *Style of Writing.* The abstract should be written concisely and in normal rather than abbreviated English. Where possible, standard terms should be used and unnecessary contracting should be avoided. The third person is preferable. Mixed tenses, and both indicative and imperative forms should be avoided.

It should be presumed that the reader has some knowledge of the subject, but has not read the paper. He may not even have the paper available at all, if he is working with the abstract journal only. The abstract should, therefore, be intelligible in itself, without reference to the paper; for example, it should not cite sections or illustrations as a substitute for a statement of their content.

3. *Content.* The title of the paper is usually read as part of the abstract, therefore repetition of the title in the opening sentence of the abstract should be avoided. If the title is insufficiently comprehensive to indicate the subjects covered or the objects of the investigation, the opening sentence should make this clear.

The abstract should state newly observed facts, conclusions of an experiment or argument and, if possible, the essential parts of any new theory, treatment, apparatus, technique, etc.

It should contain the names of any new compound, and any new numerical data, such as physical constants; if this is not possible it should draw attention to them. It is important to refer to new items and observations, even though they may be incidental to the main purpose of the paper.

When giving experimental results, the abstract should indicate the methods used; for new methods, the basic principle, range of operation, and degree of accuracy should be given.

4. *Detail of Layout.* It is impossible to recommend a standard length for an abstract. It should, however, be concise and should not normally exceed 200 words. References should be omitted from the abstract whenever possible.

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NUMERICAL INDEX OF REPORTS

Numerical Index of Official Atomic Energy Reports with Indications of Their Availability

This quarterly cumulation supplements the Numerical Index of Reports which appears in NSA, Vol. 6, No. 24A, and the quarterly cumulation in Vol. 7, No. 6B. As reports are in manuscript form when abstracted for NSA, there may be some delay before the reports will be available at the Depository Libraries. The notation NSA in the Availability column indicates the appearance of a report in its entirety in NSA. In general, this list refers only to those reports abstracted in issues preceding the current one. Orders for items for which prices are indicated should be directed to:

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- NNES - National Nuclear Energy Series, published by the McGraw-Hill Book Company

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[redacted]	7-466	Tech. Bull. Registry Med. Technols. 23, 65-72(1953)
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2302	7-659	Phys. Rev. 89, 1251-4(1953)
[redacted]	7-612	J. Chem. Phys. 20, 1981-2(1952)
2323	7-778	J. Am. Chem. Soc. 75, 1110-15(1953)
2332	7-1348	$0.20
2334	7-1364	Proc. Soc. Exptl. Biol. Med. 82, 248-52 (1953)
2335	7-1317	J. Histochem. and Cytochem. 1, 123-37 (1935)
2345	7-1365	J. Am. Chem. Soc. 75, 1680-4(1953)
2346	7-1829	NSA
2354	7-1779	Phys. Rev. 90, 420-8(1953)
2355	7-1327	Refrig. Eng. 61, 55-7, 104(1953)
2358	7-1679	Phys. Rev. 90, 393-400(1953)
[redacted]	7-1574	Proc. Soc. Exptl. Biol. Med. 82, 137-40 (1953)
2365	7-1780	Phys. Rev. 89, 665(1953)
[redacted]	7-1623	J. Chem. Phys. 21, 381-2(1953)
2367	7-1830	J. Chem. Phys. 21, 372-3(1953)
2369	7-1580	Nucleonics 11, No. 3, 29-31(1953)
2377	7-1581	Proc. Soc. Exptl. Biol. Med. 82, 208-12 (1953)
2384	7-1789	Phys. Rev. 89, 1302-3(1953)
2387	7-1577	Proc. Soc. Exptl. Biol. Med. 81, 125-8(1952)
[redacted]	7-1867	J. Natl. Cancer Inst. 13, 1123-38(1953)
[redacted]	7-2139	Phys. Rev. 89, 1156-7(1953)
[redacted]	7-2116	NSA; Phys. Rev. 89, 1306(1953)
2398	7-2270	Published in four installments as follows: Arch. Biochem. and Biophys. 31, 72-6 (1951); Biochim. et Biophys. Acta 9, 240-6(1952); Biochim. et Biophys. Acta 9, 597-600 (1952); and J. Polymer Sci. 10, 333-44(1953)
2421	7-2486	NSA
2426	7-2245	Arch. Ind. Hyg. Occupational Med. 7, 148-148-51(1953)
2437	6-3069	Science 115, 284-5(1952)
2440	7-2894	Phys. Rev. 89, 1165-70(1953)
2441	7-2875	Phys. Rev. 89, 1271-2(1953)
2451	7-2716	NSA
2462	7-2878	Phys. Rev. 90, 321-2(1953)
2464	7-2987	J. Chem. Phys. 21, 575-88(1953)
2465	7-2988	J. Chem. Phys. 21, 597-601(1953)

REPORT	ABSTRACT	AVAILABILITY
AECU	NSA	
2479	7-2757	J. Chem. Phys. 21, 589-97(1953)
2487	7-2941	J. Am. Chem. Soc. 75, 1741-2(1953)
2499	7-3219	Phys. Rev. 90, 460-3(1953)
2500	7-3198	Phys. Rev. 90, 464-8(1953)
2501	7-2979	J. Biol. Chem. 200, 661-8(1953)
AERE C/M		
127	6-2587	1s.0d.
129	6-2770	1s.0d.
131	6-2872	1s.3d.
132	6-3522	1s.3d.
152	7-100	2s.6d.
154	7-520	1s.0d.
AERE C/R		
552	5-2221	1s.9d.
801	6-2860	7s.0d.
813	6-3771	4s.6d.
861	6-5114	7s.6d.
[redacted]	6-6510	12s.6d.
[redacted]	7-3156	6s.6d.
988	7-2008	3s.0d.
1004	7-1407	4s.0d.
1061	7-2864	Phil. Mag. (7) 44, 208-11(1953)
AERE EL/R		
750	7-1472	3s.0d.
805	6-2709	3s.0d.
AERE E/R		
817	6-2654	2s.6d.
AERE G/M		
96	6-2367	J. Sci. Instr. 29, 336-7(1952)
144	7-3136	1s.3d.
AERE G/R		
462	4-2712	1s.6d.
477	4-6126	2s.0d.
478	4-4883	4s.0d.
480	4-3477	1s.6d.
784	6-1185	2s.6d.
1020	7-1464	3s.6d.
1039	7-2028	1s.6d.
AERE I/M		
16	6-2890	1s.9d.
18	7-517	1s.0d.
AERE Inf. Bib.		
76	6-1529	5s.0d.
80	6-1423	1s.0d.
[redacted]	7-212	1s.3d.
AERE I/R		
1038	7-3146	2s.6d.
AERE M/R		
427	5-119	J. Inst. Metals 77, 553-69(1950)
AERE N/R		
370	3-1971	2s.6d.
987	6-6670	Phil. Mag. (7) 44, 77-84(1953)
AERE R/L		
[redacted]	7-666	5s.0d.

REPORT	ABSTRACT	AVAILABILITY
AERE R/R	NSA	
922	7-667	Nucleonics 11, No. 2, 50-60 (1952); 6s.0d.
961	7-1506	2s.0d.
1019	7-1473	1s.9d.
1035	7-1507	1s.3d.
AERE T/M		
68	7-1517	2s.0d.
AERE T/R		
334	4-2758	8s.0d.
437	4-1523	1s.6d.
443	4-1324	1s.9d.
451	4-2045	1s.6d.
467	4-2421	2s.6d.
802	6-1003	2s.6d.
1006	7-1463	2s.6d.
1008	7-1494	2s.6d.
1062	7-2723	1s.6d.
1072	7-3229	1s.6d.
AMRL		
74	6-3181	Science 117, 155-6(1953)
ANL		
4808	6-4037	J. Chem. Phys. 21, 419-23(1953)
4816	6-4132	Rev. Sci. Instr. 24, 148-51(1953)
ARL-RI/R		
251	5-2510	J. Sci. Instr. 29, 189-92(1952)
BMI		
758	6-5377	$0.10
773	7-1111	0.10
BNL		
97	5-4647	Biol. Progress 2, 1-52(1952)
196	7-1857	$0.95
216	7-2118	$0.10
1010	6-546	J. Bacteriol. 63, 661-4(1952)
1016	5-6999	Arch. Biochem. and Biophys. 34, 478-9 (1951)
1055	6-1373	Heating and Ventilating 49, 95(1952)
1058	6-1792	Anal. Chem. 24, 1356-7(1952)
1117	6-2357	Electrical Const. and Maint. 51, 58-9(1952)
1137	6-2804	Agron. J. 44, 610-14(1952)
1138	6-3203	Am. J. Physiol. 172, 93-9(1953)
1146	6-3148	Arch. Biochem. and Biophys. 43, 33-8 (1953)
1188	6-5009	Am. Naturalist. 87, 29-48(1953)
1198	6-5263	Am. Naturalist 86, 391-8(1952)
1203	6-5427	Rev. Sci. Instr. 24, 141-8(1953)
1205	6-5300	J. Am. Chem. Soc. 75, 28-30(1953)
1212	6-5355	J. Am. Chem. Soc. 75, 30-3(1953)
1224	6-5987	J. Biol. Chem. 200, 565-9(1953)
1227	6-5935	J. Bacteriol. 65, 305-9(1953)
1231	6-6149	Physica 18, 1034-6(1952)
1233	6-6119	NSA; Rev. Sci. Instr. 23, 769(1952)
1234	6-6120	Rev. Sci. Instr. 23, 765(1952)
1235	6-5988	J. Biol. Chem. 200, 525-8(1953)
1240	6-6388	Revs. Modern Phys. 25, 114-21(1953)
1245	6-5983	J. Am. Chem. Soc. 75, 1827-30(1953)
1247	6-6091	Science 117, 1-3(1953)
1256	6-6530	J. Am. Chem. Soc. 75, 728-30(1953)
1262	6-6707	J. Am. Chem. Soc. 75, 1256-7(1953)
1272	7-473	Proc. Soc. Exptl. Biol. Med. 81, 836-8(1952)
1277	7-1608	Nucleonics 11, No. 3, 49-51(1953)
1280	7-599	Phys. Rev. 89, 826-31(1953)
1288	7-691	Physica 18, 1110-11(1952)
1290	7-2399	NSA
1300	7-999	Phys. Rev. 89, 1267-70(1953)
1304	7-1181	$0.25

REPORT	ABSTRACT	AVAILABILITY
BNL	NSA	
1305	7-1498	Phys. Rev. 89, 1081-9(1953)
1307	7-1374	J. Am. Chem. Soc. 75, 1795-7(1953)
1322	7-1500	Physica 18, 1091-3(1952)
1327	7-1526	Phys. Rev. 90, 430-9(1953)
1329	7-1596	Arch. Ind. Hyg. Occupational Med. 7, 109-10(1953)
1330	7-1718	$0.20
1333	7-1790	Phys. Rev. 89, 880-1(1953)
1337	7-1736	Phys. Rev. 89, 1148(1953)
1338	7-2119	NSA; Phys. Rev. 89, 1146(1953)
1341	7-2198	Nucleonics 11, No. 3, 18-20(1953)
CEA		
149	7-1724	J. phys. radium 13, 670-1(1952)
CRP		
527	7-2382	Can. J. Phys. 31, 267-77(1953)
HW		
25210	6-6121	Nucleonics 11, No. 4, 28-31(1953)
25258	7-235	$0.10
26763	7-1831	$0.20
ISC		
216	6-3546	J. Phys. Chem. 57, 215-19(1953)
231	6-4394	J. Am. Chem. Soc. 75, 1388-92(1952)
260	6-5991	Anal. Chem. 25, 249-52(1953)
263	6-5738	Anal. Chem. 25, 416-19(1953)
264	6-6014	J. Org. Chem. 18, 267-75(1953)
269	7-77	Anal. Chem. 25, 407-11(1953)
282	7-419	Revs. Modern Phys. 25, 129-30(1953)
K		
751	5-3903	Anal. Chem. 25, 619-24(1953)
939	6-6000	J. Chem. Phys. 21, 602-8(1953)
940	7-532	J. Chem. Phys. 21, 609-14(1953)
980	7-782	J. Am. Chem. Soc. 75, 1211-14(1953)
KAPL		
385	5-867	J. Applied Phys. 23, 1085-8(1952)
LA		
1475	7-617	$0.35
LADC		
1183	7-2637	Rev. Sci. Instr. 24, 91-6(1953)
M		
1980	1-906	NNES Div. VI, Vol. 1, Pt. IV, Chap. 25
4795	7-1866	Proc. Natl. Acad. Sci. U.S. 38, 706-15 (1952)
MIT		
1103	7-1434	$0.20
MTA		
10	7-2544	$0.20
23	7-2855	$0.10
NAA-SR	NSA	
178	6-3572	Rev. Sci. Instr. 24, 80-1(1953)
NBS		
1762	6-6036	Rev. Sci. Instr. 24, 326-7(1953)
1955	7-348	Phys. Rev. 90, 146-50(1953)
2308	7-2767	$0.20

REPORT	ABSTRACT	AVAILABILITY
NM	NSA	
006-012.04.54	7-493	Am. J. Physiol. 170, 418-25 (1952)
NP		
3583	6-2104	Phys. Rev. 90, 115-19(1953)
3596	6-2117	Acta Cryst. 5, 811-17(1952)
3830	6-4015	J. Am. Chem. Soc. 75, 1560-2(1953)
4000	6-5568	J. Am. Chem. Soc. 75, 1830-2(1953)
4043	6-6554	J. Am. Chem. Soc. 75, 1232-36(1953)
4188	6-2480	Phys. Rev. 85, 532-9(1952)
4202	7-1286	J. Chem. Phys. 20, 1979(1953)
4215	7-1610	J. Phys. Chem. 57, 385-90(1953)
4223	7-812	Vide, Le 7, 1262-6(1952) (In French)
4267	7-1652	J. Am. Chem. Soc. 75, 860-3(1953)
4352	6-6095	J. Applied Phys. 23, 1028-32(1952)
NYO		
729	6-1631	J. Am. Chem. Soc. 75, 451-5(1953)
769	6-6363	J. Applied Phys. 24, 52(1953)
793	6-1400	Anal. Chem. 25, 482-6(1953)
1642	6-3743	Radiology 59, 849-57(1952)
3001	6-2740	Phys. Rev. 85, 489-90(1952)
3006	6-1801	Rev. Sci. Instr. 24, 193-5(1953)
3067	6-5315	Anal. Chem. 25, 127-30(1953)
3201	7-2897	Phys. Rev. 90, 160-1(1953)
3225	6-6134	Phys. Rev. 89, 766-74(1953)
3262	7-2181	Phys. Rev. 89, 664(1953)
3367	6-1633	J. Am. Chem. Soc. 75, 455-7(1953)
3368	6-1634	J. Am. Chem. Soc. 75, 457-60(1953)
3581	6-4411	J. Electrochem. Soc. 100, 131-5(1953)
3631	7-2761	J. Am. Chem. Soc. 75, 1735-6(1953)
3661	6-6440	Phys. Rev. 90, 83-6(1953)
3814	7-2671	J. Applied Phys. 24, 365(1953)
3871	7-711	J. Am. Chem. Soc. 75, 466-70(1953)
3901(p.15-36)	7-390	Phys. Rev. 89, 679-83(1953)
4026	6-6524	New Engl. J. Med. 247, 877-80 (1952)
4435	6-6576	$0.80
4436	6-6542	0.45
4503	7-2300	Nucleonics 11, No. 4, 34-9(1953)
4506	7-1966	$0.20
ORNL		
1044	6-192	Instruments 25, 1096-1101(1952)
1342	7-1695	$0.20
1347	6-6689	$0.20
1405	7-626	$0.20
1414	7-2425	0.25
1461	7-2307	$0.20
1470	7-2030	0.20
1499	7-2880	$0.10
ORO		
81	7-113	J. Chem. Phys. 21, 383-93(1953)
RCC/R		
26	7-245	4s.0d.
[redacted]		
87	7-1443	$0.25
120	7-2308	$0.45
SO		
3501	7-539	$0.55
UCLA		
128	5-3849	Am. J. Roentgenol. Radium Therapy Nuclear Med. 68, 950-3(1952)
134	5-4105	Rev. Sci. Instr. 24, 78-9(1953)
181	6-1617	J. Am. Pharm. Assoc., Sci. Ed. 41, 614-17 (1952)
200	6-3890	J. Bacteriol. 65, 151-6(1953)
203	6-4682	Cancer Research 12, 818-22(1952)
205	6-4344	Cancer Research 12, 823-8(1952)
207	6-5277	Science 117, 139-40(1953)
209	6-5418	Rev. Sci. Instr. 24, 269-71(1953)
210	6-5419	Electronics 26, 124-5(1953)
211	6-5509	J. Opt. Soc. Amer. 43, 42-3(1953)
213	6-5253	Am. J. Physiol. 172, 195-202(1953)
214	6-5254	Am. J. Physiol. 172, 203-10(1953)
216	6-5552	Ann. Allergy 11, 1-11(1953)
217	6-5540	Proc. Soc. Exptl. Biol. Med. 81, 298-300 (1952)
220	6-5887	Rev. Sci. Instr. 24, 73-4(1953)
222	6-5971	Arch. Biochem. and Biophys. 43, 118-26 (1953)
224	7-40	Proc. Soc. Exptl. Biol. Med. 81, 665-7 (1952)
231	7-101	Am. Ind. Hyg. Assoc. Quart. 14, 26-30 (1953)
237	7-714	$0.20
244	7-2719	J. Am. Pharm. Assoc. Sci. Ed. 41, 614-17 (1953)
UCRL		
1198	5-3647	$0.25
1390	7-496	J. Aviation Med. 23, 345-72(1952)
1505	6-93	J. Am. Chem. Soc. 74, 3431(1952)
1549	6-38	Am. J. Physiol. 172, 579-87(1953)
1621(rev)	6-5464	Phys. Rev. 87, 425-33(1952)
1687	6-3261	J. Am. Chem. Soc. 75, 474-9(1953)
1720	6-3260	Ann. Rev. Phys. Chem. 3, 215-28(1952)
1795	6-4083	Elec. Eng. 72, 212-18(1953)
1863	7-1631	$0.25
1875	6-5864	J. Am. Chem. Soc. 74, 4216(1952)
1876	6-6435	Phys. Rev. 90, 183-5(1953)
1899	6-5856	Phys. Rev. 90, 224-32(1953)
1913(rev.)	7-350	Phys. Rev. 89, 603-5(1953)
1918	6-6330	J. Am. Chem. Soc. 75, 796-7(1953)
1937	6-6696	Phys. Rev. 89, 1019-22(1953)
1939	6-6671	Phys. Rev. 90, 469-72(1953)
1950	7-510	$0.35
1955	7-41	Nucleonics 11, No. 3, 56, 58(1953)
1956	7-58	J. Am. Chem. Soc. 75, 1962-7(1953)
1960	7-351	Phys. Rev. 89, 790-2(1953)
1991	7-681	Phys. Rev. 89, 758-9(1953)
1996	7-978	$0.55
2004	7-1095	$0.20
2005	7-937	Phys. Rev. 89, 878-9(1953)
2008	7-1402	$0.25
2013	7-1486	$0.55
2019	7-1834	Phys. Rev. 90, 267-70(1953)
2031	7-1816	Phys. Rev. 89, 879-80(1953)
2037	7-1519	$0.20
2041	7-2533	$0.20
2060	7-1835	$0.55
2062	7-1763	0.35
2075	7-2613	0.10
2079	7-1839	$0.10
2108	7-2828	0.20
UR		
78	3-1623	Science 111, 117-8(1950)
132	5-1249	J. Am. Chem. Soc. 73, 1212-15(1951)
142(p.29-40)	5-2369	Am. J. Physiol. 163, 715(1950); J. Pharmacol. Exptl. Therap. 101, 14(1951)
176	5-4308	J. Biol. Chem. 193, 243-51(1953)
185	6-2560	Biochim et Biophys. Acta 8, 369-74(1952)
187	5-6953	Proc. Soc. Exptl. Biol. Med. 78, 687-9 (1951)
213(p.56)	6-5541	Federation Proc. 11, 133(1952)
213(p.57)	6-5541	Federation Proc. 11, 183(1952)

REPORT	ABSTRACT	AVAILABILITY
UR	NSA	
213(p.58)	6-5541	Federation Proc. 11, 278(1952)
213(p.59)	6-5541	Federation Proc. 11, 280(1952)
213(p.60)	6-5541	Federation Proc. 11, 260(1952)
213(p.61)	6-5541	Federation Proc. 11, 182(1952)
213(p.62)	6-5541	Federation Proc. 11, 299(1952)
213(p.63)	6-5541	Federation Proc. 11, 4(1952)
213(p.64)	6-5541	Federation Proc. 11, 114(1952)
213(p.65)	6-5541	Federation Proc. 11, 423(1952)
213(p.66)	6-5541	Federation Proc. 11, 359(1952)
213(p.67)	6-5541	Federation Proc. 11, 416(1952)
213(p.68)	6-5541	Federation Proc. 11, 278(1952)
213(p.69)	6-5541	Federation Proc. 11, 162(1952)
215	6-5543	J. Biol. Chem. 200, 759-63(1953)
233	7-2463	Am. J. Anat. 92, 153-87(1953)
USNRDL		
340	6-3490	J. Aviation Med. 24, 57-62(1953)

NEW NUCLEAR DATA

Summary of New Nuclear Data on Half Lives, Radiations, Relative Isotopic Abundances, Nuclear Moments, Neutron Cross Sections, Reaction Energies, and Masses.

Prepared by National Bureau of Standards Nuclear Data Group with assistance of Readers.

National Bureau of Standards Group: K. Way, C. L. McGinnis, M. Wood, and K. Thew.

Leaders of groups in other laboratories which are assisting with the abstracting: G. Scharff-Goldhaber, Brookhaven National Laboratory; J. M. Hollander, University of California; C. S. Wu, Columbia University; P. Axel, University of Illinois; A. C. G. Mitchell; L. M. Langer, University of Indiana; J. R. Stehn, Knolls Atomic Power Laboratory; H. Pomerance, Oak Ridge National Laboratory; E. O. Wiig, R. W. Fink, University of Rochester; W. E. Meyerhof, Stanford University; L. Slack, Naval Research Laboratory.

The material cumulated here is that which has appeared in NSA Vol. 7, Nos. 7 through 12A.

ABBREVIATIONS

a	absorption measurement
a$\beta\gamma$	absorption of β's in coincidence with γ's
ace$^-$	absorption of conversion electrons
a coin	measurement by placing absorbers between counters in coincidence
α	total γ-ray conversion coefficient, N_e/N_γ
$\alpha_K, \alpha_L, \ldots$	γ-ray conversion coefficient for electrons ejected from the K,L,... shell
b	coefficient in angular correlation function, $1 + b \cos^2 \theta$
B	band spectra method
Beγn	measurement by detection of photoneutrons from Be
$\beta\gamma, \gamma\gamma$	$\beta\gamma$ or $\gamma\gamma$ coincidences
$\beta\gamma(\theta)$	angular correlation of β's and γ's in coincidence
Calc	calculated value from experimental work reported elsewhere
cc	cloud chamber
ce$^-$	conversion electrons
chem	chemical separation of product following reaction
Cpt	Compton electrons
d	(1) deuteron, (2) descendant of, (3) days, when used as superscript
d,p(θ)	angular distribution of protons with respect to deuteron beam
Dγn,Dγp	measurement by detection of photoneutrons or photoprotons from deuterium
E	average energy
E_0	resonance energy
$E_\beta, E_\gamma, \ldots$	energy of β ray, energy of γ ray,...
E_{dis}	disintegration energy
EA	electrostatic analyzer
E1,E2,...	electric dipole, electric quadrupole
ϵ	electron capture
ϵ_K, ϵ_L	electron capture from K, L shell
f	fission, in abbreviations for methods of production or detection
F-K	Fermi-Kurie β energy distribution plot
$\gamma(\theta$,T)	numbers of γ's as function of angle and temperature
Γ	resonance half-width (the whole width at half-maximum)
g.s.	ground state
I	(1) spin in units of $h/2\pi$; (2) nuclear induction magnetic resonance method
ic	ionization chamber
J	quantum state of compound nucleus in a nuclear reaction. "I" is used to denote the spin of the target nucleus, final nucleus
K/L	α_K/α_L
l	angular momentum of particle absorbed into nucleus
M	molecular or atomic beam resonance method
M1,M2,...	magnetic dipole, magnetic quadrupole...

mb	millibarns
Mic	microwave method
mir	measurement by total reflection of neutron beam from mirror surface
ms	mass spectrometer
μ	(1) magnetic moment in units of nuclear magnetons, (2) micron, 10^{-4} cm
μs	microseconds
osc	pile oscillator method
p	(1) proton, (2) predecessor of
para	paramagnetic resonance method
pc	proportional counter
pe^-	photo electrons
ppl	photoplates or emulsions
q	electric quadrupole moment in units of barns
Q	reaction energy in Mev
s	(1) spectrometer method, (2) seconds, when used as superscript
S	atomic-spectra measurement
scin	scintillation counter
sl	lens spectrometer
sl;ce^-	conversion electrons measured in lens spectrometer
st	strong
$s\pi$	180° spectrometer
$s\pi\sqrt{2}$	double focusing spectrometer
σ	cross section in barns
σ_0	cross section at resonance energy, E_0
σ_a	absorption cross section
σ_{el}	elastic scattering cross section
σ_{in}	inelastic scattering cross section
σ_s	scattering cross section
σ_t	total cross section
t	triton, H^3
τ	half life in units indicated
τ_1, τ_2	half life of upper, lower state
th	thermal
w,vw	weak, very weak
(0.123)	β and γ energy values enclosed in parentheses are given for identification purposes
%	% of disintegrations
†	relative numbers. When used in connection with γ rays, relative numbers of photons, not photons plus conversion electrons, are meant
+,−	even, odd parity

Standard journal abbreviations are used.
All energies are given in Mev and all cross sections in barns unless otherwise stated in the tabular material.

MAGNETIC MOMENT STANDARDS

In order to have a consistent basis for recording data on magnetic moments, results have been based on the following values and are without diamagnetic corrections.

$\mu(H^1) = 2.7934$ nuclear magnetons
This value has been adopted arbitrarily because it is the one used as a base in the Table of H. L. Poss, The Properties of Atomic Nuclei, I. Spins, Magnetic Moments and Electric Quadrupole Moments. (Revised, BNL-26 (T-10), (unclassified).) The values reported in the New Nuclear Data summaries are thus directly comparable with those listed in the survey of Poss.

$\nu(Na^{23})/\nu(H^1) = 0.26450$ E. Bleuler, M. Gabriel, Helv. Phys. Acta 20, 67(1947).

$\nu(D)/\nu(H^1) = 0.153506$ F. Bloch, E. C. Levinthal, M. E. Pachard, Phys. Rev. 72, 1125(1947).

$\nu(B^{11})/\nu(H^1) = 0.320827$ D. A. Anderson, Phys. Rev. 76, 434(1949).

NEW NUCLEAR DATA

He^{4} (2 2)

$H^3(p,\gamma)$ $E_p = 1$ to 5.2

No resonance for production of $\sim$20-Mev γ's

γ yield curve flattens at $\sim E_p = 3.5$

H.B.Willard, J.K.Bair, J.D.Kington, ORNL-1415, 3(1952).

$He^3(d,p)$ $E_d = 10.2$ ppl

No level below 20.9 Mev ($d\sigma/d\Omega$ for excited state < 0.2 mb/sterad. at 90° lab.)

J.C.Allred, Phys. Rev. 84, 695(1951).

$He^4(p,p')$ $E_p = 32$ pc

No level below 23.3 Mev ($d\sigma/d\Omega$ for low energy p group < 0.1 mb/sterad. at 45° c.m.)

J.Benveniste, B.Cork, Phys. Rev. 89, 422(1953).

He^{5} (2 3)

Levels $H^3(He^3,p)$ $E_{He^3} = 0.30$ scin

g.s. group observed at $E_p = 9.05$

No other p group found

W.M.Good, W.E.Kunz, C.D.Moak, ORNL-1415(1952).

Li^{6} (3 3)

No reaction $Li^6(\gamma,d)He^4$

$\sigma < \sim 6 \times 10^{-6}$ for $E_\gamma = 2.76, \sim 7, 17.6$

Isotopic spin forbidden*

*A.Bamba, V.Wataghin, Nuovo Cim. 10, 174(1953).
E.W.Titterton, T.A.Brinkley, Proc. Phys. Soc. 65A, 1052(1952).

Li^{7} (3 4)

Level $Li^6(d,p)$ $Be^9(d,\alpha)$ s

0.477

E.R.Collins, C.D.McKenzie, C.A.Ramm, Proc. Roy. Soc. 216A, 242(1953).

Levels $Be^9(d,\alpha)$ s

Level	$E_d = 0.47$	$E_d = 1.0$
g.s.	100†	100†
(0.48)	100†	70†
4.62	20†	100†

H^3 continuum observed from 4.62 level

†Relative yields at 90°

R.W.Gelinas, S.S.Hanna, Phys. Rev. 89, 483(1953).

Levels $B^{10}(n,\alpha)$ $E_n = th$ pc

5.8† g.s.

94.2† (0.48)

† Relative cross sections

U.H.Hauser, Z. Naturf. 7a, 781(1952).

Level $Li^6(d,p\gamma)$ $E_d = 0.41$

$p\gamma(\theta)$ (0.478) $I = 1/2$

A.J.Salmon, E.K.Inall, Proc. Phys. Soc. 66A, 297(1953).

Li^{7} (3 4)

Level $Li^6(n,t)He^4$ $E_n = 0.27$ ppl

$n,t(\theta)$ (7.4) $J = 5/2$

W.O.Solano, J.M.Roberts, Phys. Rev. 89, 892A (1953).

Levels $Li^7(\gamma,\alpha)H^3$ $E_\gamma = 6.13$ ppl

$\gamma,\alpha(\theta)$ suggests 3/2 +, 1/2 − interference

$\sigma = 2.7 \times 10^{-5}$

H.Nabholz, P.Stoll, H.Wäffler, Helv. Phys. Acta 25, 701(1952).

Resonances $Li^7(\gamma,t)He^4$ $E_\gamma \leq 24$ ppl

9.3 21.5 ?

16.7 ? 23.5 ?

No structure resolved for $Li^7(\gamma,p)He^6$

E.W.Titterton, T.A.Brinkley, Proc. Phys. Soc. 66A, 194(1953).

Li^{8} (3 5)

τ 0.87^s Li(0.6-Mev d)

P.Bretonneau, Compt. rend. 236, 913(1953).

I 3 ? $Li^7(d,p)$ scin

(12.5β)(1.5α)(θ) consistent with

$I = 3$, 2, 0 and not $I = 0$, 2, 0

C.M.Class, S.S.Hanna, Phys. Rev. 89, 877(1953).

Li^{9} (3 6)

β^- and 2 α's found in μ meson star

$E_{\beta_9} \sim 8$, E_α(total) $= 4.4$ indicate decay of Li^9 via 6.8 level of Be^9

W.F.Fry, Phys. Rev. 89, 325(1953).

Be^{7} (4 3)

No reaction observed for $He(\alpha,n)$

$\sigma < 7 \times 10^{-4}$ for $E_\alpha = 39$ (threshold = 38)

Consistent with odd parity for g.s.

D.Walker, W.T.Link, W.I.B.Smith, Proc. Phys. Soc. 65A, 861(1952).

Be^{8} (4 4)

Level $Be^9(d,t)$ ppl

g.s.

$d,t(\theta)$ for $E_d = 0.295, 0.40, 0.45, 0.52, 0.62$

D.deJong, P.M.Endt, L.J.G.Simons, Physica 18, 676(1952).

Levels $B^{10}(d,\alpha)$ $E_d = 0.59, 0.78, 1.07$ ic

g.s

2.9 $I = 2$*

*From fit of theoretical curve to α energy spectrum

Only two α peaks at $E_\alpha \sim 12, \sim 9$

P.B.Treacy, Phil. Mag. 44, 325(1953).

$^{8}_{4}Be_{4}$

Levels $Be^9(d,t)$ $E_d = 1.0$ s
3.5† g.s.
15† (2.9)
†Relative yields at 90°

R.W.Gelinas, S.S.Hanna, Phys. Rev. 89, 483(1953).

Levels $Li^6(He^3,p)$ $E_{He^3} = 0.72$ scin
g.s.
3.2
Only two peaks at $E_p = 14.6$, 12.0

W.M.Good, W.E.Kunz, C.D.Moak, ORNL-1415(1952).

Levels $Li^7(d,n)$ $E_d = 0.68$ ppl
2.2 ?* 4.1
2.9 5.0
*Seen for small angles only
d,n(θ) shows both stripping and compound nucleus formation

B.Trumpy, T.Grotdal, A.Graue, Nature 170, 1118 (1952).

Level $Li^7(d,p\beta^-)2\alpha$ scin
(~3) I = 2
(12.5β) (1.5α) (θ) consistent with I = 3, 2, 0

C.M.Class, S.S.Hanna, Phys. Rev. 89, 877(1953).

Resonance $Li^7(p,\gamma)$ $\Gamma = 12.2$ kev EA
0.4415

S.E.Hunt, Proc. Phys. Soc. 65A, 982(1952).

$^{10}_{4}Be_{6}$

Capture γ's $Be^9(n,\gamma)$ pair s
25 † 3.41
75 † 6.81
No 6.3γ observed
†Photons per 100 n captures

G.A.Bartholomew, B.B.Kinsey, Can. J. Phys. 31, 49(1953).

Level Be(d,p) ppl
g.s.
d,p(θ) for E_d = 0.295,0.40,0.45,0.52,0.62

D.deJong, P.M.Endt, L.J.G.Simons, Physica 18, 676(1952).

$^{10}_{5}B_{5}$

μ 1.80114* I
1.80082**
$*\nu(B^{10})/\nu(D) = 0.700065 \pm 0.00007$
$**\nu(B^{10})/\nu(Rb^{85}) = 1.11282 \pm 0.00005$
$Na_2B_2O_4$, D_2O, RbCl

Y.Ting, D.Williams, Phys. Rev. 89, 595(1953).

Level $B(n,n\gamma)$ $E_n = 2.5$
γ 0.717 scin

R.B.Day, Phys. Rev. 89, 908A(1953).

$^{11}_{5}B_{6}$

$Be^9(d,t)Be^8$ $E_d = 1.3$ ppl
d,t(θ) shows forward peaking suggesting pick-up

P.Cuër, J.J.Jung, Phys. Rev. 89, 1151(1953).

$^{11}_{5}B_{6}$

$Be^9(d,t)Be^8$ $Be^9(d,p)Be^{10}$
σ's equal for $E_d < 0.40$ ppl

D.deJong, P.M.Endt, L.J.G.Simons, Physica 18, 676(1952).

$^{12}_{5}B_{7}$

τ 0.022^s B(0.6-Mev d)

P.Bretonneau, Compt. rend. 236, 913(1953).

$^{11}_{6}C_{5}$

τ 20.25^m C^{12}(30-Mev p) scin

W.M.Martin, S.W.Breckon, Can. J. Phys. 30, 643 (1952).

τ 20.74^m C(21-Mev He^3)

D.N.Kundu, T.W.Donaven, M.L.Pool, J.K.Long, Phys. Rev. 89, 1200(1953); Physica 18, 1304(1952).

$^{12}_{6}C_{6}$

Levels $B^{11}(d,n)$ $E_d = 8.1$ ppl
g.s. $l_p = 1$
(4.43) $l_p = 1$

W.M.Gibson, Phil. Mag. 44, 297(1953).

Level $N^{15}(p,\alpha\gamma)$ $E_p = 0.429$, s
p,$\gamma(\theta)$; p,$\alpha(\theta)$ 0.890, 1.210
(4.43) I = 2 +

A.A.Kraus, Jr., A.P.French, W.A.Fowler, C.C.Lauritsen, Phys. Rev. 89, 299(1953).

Level $C^{12}(p,p\gamma)$ $E_p = 7.1$ scin
p,$\gamma(\theta)$ (4.43) I = 2

H.E.Gove, N.S.Wall, Can J. Phys. 31, 189(1953).

Level $C^{12}(n,n\gamma)$ $E_n = 5.5$
γ 4.45 scin

R.B.Day, Phys. Rev. 89, 908A(1953).

Levels $B^{11}(p,\gamma)$ $E_p = 0.7$
(~16.1)
p,$\gamma(\theta)$ for 11.8γ indicates interference between levels of opposite parity

G.L.Jenkins, L.W.Cochran, H.H.Given, J.L.Ryan, T.M.Hahn, B.D.Kern, BAPS 28, 2, DA7(1953).

Levels $C^{12}(\gamma,3\alpha)$ $E_\gamma \leq 70$ ppl
18 others ? 310 stars
29

W.K.Dawson, C.B.Bigham, Can. J. Phys. 31, 167 (1953).

$C^{12}(\gamma,\alpha)Be^8$ $E_\gamma = 17.6$ ppl
$\sigma(Be^8$ g.s.$)/\sigma(Be^8$ ~3-Mev level$) = 0.025$ (cf O^{16})

H.Nabholz, P.Stoll, H.Wäffler, Helv. Phys. Acta 25, 701(1952).

$^{13}_{6}C_{7}$

Capture γ's $C^{12}(n,\gamma)$ pair s
30 † 3.68
70 † 4.95
No 3.9γ observed (< 6†)
† Photons per 100 n captures

G.A.Bartholomew, B.B.Kinsey, Can. J. Phys. 31, 49(1953).

$C^{14}_{6\ 8}$

F-K plot concave toward energy axis below 50 kev although S^{35} and Pm^{147} plots linear to 10 kev

J.P.Mize, D.J.Zaffarano, BAPS 28, 2 DA6(1953).

$N^{14}_{7\ 7}$

μ 0.40370 I
$\nu(N^{14})/\nu(Rb^{85}) = 0.74837 \pm 0.00004$
HNO_3, RbCl

Y.Ting, D.Williams, Phys. Rev. 89, 595(1953).

$O^{15}_{8\ 7}$

Levels	$N^{14}(d,n)$	$E_d = 7.7$ ppl
	g.s.	$l_p = 1$
	5.3	$l_p = 2$?
	6.2	$l_p = 1$?
	6.8	$l_p = 0$
	7.5	$l_p = 1$?
	8.4	$l_p = 1$?
	9.1	$l_p = 1$?

W.H.Evans, T.S.Green, R.Middleton, Proc. Phys. Soc. 66A, 108(1953).

$O^{16}_{8\ 8}$

Levels	$N^{15}(p,\alpha\gamma)C^{12}$	scin
$p,\gamma(\theta)$	(12.51)	J = 2−
	(12.95)	J = 2−
	(13.24)	J = 3− or 4+

4.43 γ studied for $E_p = 0.43, 0.90, 1.2$

C.A.Barnes, D.B.James, G.C.Neilson, Can. J. Phys. 30, 717(1952).

Levels	$N^{15}(p,\alpha\gamma)C^{12}$	s
$p,\gamma(\theta)$	(12.51)	J = 2 −
$p,\alpha(\theta)$	(12.95)	J = 2 −
	(13.24)	J = 4 +

A.A.Kraus, Jr., A.P.French, W.A.Fowler, C.C.Lauritsen, Phys. Rev. 89, 299(1953).

Levels $O^{16}(n,n)$ $E_n = 14.1$ cc
(~6 Mev excitation)/(~12 Mev excitation) ~5

J.P.Conner, Phys. Rev. 89, 712(1953).

$O^{16}(\gamma,\alpha)C^{12}$ $E_\gamma = 17.6$ ppl
$\sigma(C^{12}$ g.s.)/$\sigma(C^{12}$ 4.4-Mev level) >90 (cf C^{12})
$\sigma(C^{12}$ g.s.) = 2.0×10^{-4}

H.Nabholz, P.Stoll, H.Wäffler, Helv. Phys. Acta 25, 701(1952).

$O^{17}_{8\ 9}$

Level $N^{14}(\alpha,p)$ $E_\alpha = 4.80$ ppl
0.86

E.Hjalmar, H.Slätis, Phys. Rev. 89, 1151(1953).

$O^{16}(n,n)$ $E_n = 14.1$ cc
n,n(θ) asymmetrical for elastic n's, ~symmetrical for inelastic

J.P.Conner, Phys. Rev. 89, 712(1953).

$F^{19}_{9\ 10}$

γ's $F^{19}(n,n\gamma)$ $E_n = 2.5$ scin
0.084
0.114
0.199
1.36

R.B.Day, Phys. Rev. 89, 908A(1953).

$F^{20}_{9\ 11}$

Levels	$F^{19}(d,p)$	$E_d = 3.6$ ic
d,p(θ)	g.s.	$l_n = 0$ and 2
	(0.65)	$l_n = 2$
	(~2.05)	$l_n = 2$
	(~3.49)	$l_n = 0$

D.A.Bromley, J.A.Bruner, H.W.Fulbright, Phys. Rev. 89, 396(1953).

$Ne^{20}_{10\ 10}$

Resonances $F^{19}(p,\alpha\gamma)$ EA
0.3404 $\Gamma = 2.9$ kev
0.4831 $\Gamma = 2.2$ kev

S.E.Hunt, Proc. Phys. Soc. 65A, 982(1952).

Level $Na^{23}(p,\alpha)$ $E_p = 1.46, 2.92$ EA
1.634

D.J.Donahue, K.W.Jones, M.T.McEllistrem, H.T. Richards, Phys. Rev. 89, 824(1953).

Level $F^{19}(p,\gamma)$ $E_p = 0.70$ scin
(>7.5γ) (γ) 1.66

G.A.Jones, D.H.Wilkinson, Proc. Phys. Soc. 65A, 1055(1952).

Levels	$O^{16}(\alpha,\alpha)$	
$\alpha,\alpha(\theta)$	6.738	J = 0
	7.182	J = 3
	7.218	J = 0
	7.450	J = 2
	7.854	J = 2

J.R.Cameron, R.H.Davis, A.S.Divatia, F.J.Eppling, R.W.Hill, Phys. Rev. 89, 909A(1953).

Na

Neutron resonance (ev) E_n = 1 ev to 10 kev
~3500 $\sigma_0\Gamma^2 = 58 \times 10^6$

E.R.Hodgson, J.F.Gallagher, E.M.Bowey, Proc. Phys. Soc. 65A, 992(1952).

$Na^{22}_{11\ 11}$

$(0.55\beta^+)/(1.82\beta^+) \sim 1800$ s

B.T.Wright, Phys. Rev. 89, 902A(1953).

$Na^{23}_{11\ 12}$

Level $Na^{23}(p,p)$ $E_p = 1.46$ EA
0.439

D.J.Donahue, K.W.Jones, M.T.McEllistrem, H.T. Richards, Phys. Rev. 89, 824(1953).

$Na^{24}_{11\ 13}$

I 4 M
μ +1.690
$\Delta F = \pm 1, \Delta m = \pm 1$ transitions studied
$\Delta\nu(Na^{24})/\Delta\nu(Na^{23}) = 1139.35/1771.61$

E.H.Bellamy, K.F.Smith, Phil. Mag. 44, 33(1953).

$_{12}\mathrm{Mg}^{24}_{12}$

Level	Mg(n,n'γ)	$E_n = 2.5$	
γ	1.365		scin

R.B.Day, Phys. Rev. 89, 908A(1953).

Level	Mg(p,p)	$E_p = 2.41$	EA
	1.371 ± 0.002		

D.J.Donahue, K.W.Jones, M.T.McEllistrem, H.T. Richards, Phys. Rev. 89, 824(1953).

Capture γ's	Na^{23}(p,γ)		$E_p = 0.305$ scin
28 †	1.38	≤5 †	5.8
≤4 †	2.41 ?	≤2 †	6.2
24 † {	2.88 ?	20 † {	6.8
	~3.6		7.5
	4.2	11 †	10.3

H.Casson, Phys. Rev. 87, 215A(1952); 89, 809 (1953).

$_{12}\mathrm{Mg}^{25}_{13}$

Levels	Mg^{24}(d,p)		$E_d = 8$	pc
d,p(θ) 15.4 †	g.s.	$l_n = 2$		
6.2 †	(0.58)	$l_n = 0$		
6.2 †	(0.98)	$l_n = 0$		
	(1.61)	isotropic		
5.5 †	(1.96)	$l_n = 2$		
	(~2.7)	$l_n = 0$		
8.7 †	(3.40)	$l_n = 1$		
	4.62			
	5.05			
	5.49			
	6.40			

J.R.Holt, T.N.Marsham, Proc. Phys. Soc. 66A, 258 (1953).

$_{12}\mathrm{Mg}^{26}_{14}$

Levels	Mg^{25}(d,p)		$E_d = 8$	pc
d,p(θ) ~2 †	g.s.			
13 †	(1.83)	$l_n = 0$(60%), 2(40%)		
5.7 †	(2.97)	$l_n = 0$		
6.1 †	(3.97)	$l_n = 0$		
5.6 †	(4.35)	$l_n = 0$		
3.3 †	(6.15)	$l_n = 0$		
	7.29			
	8.28			

J.R.Holt, T.N.Marsham, Proc. Phys. Soc. 66A, 258 (1953).

$_{12}\mathrm{Mg}^{27}_{15}$

τ	$9.39^m \pm 0.03$	Mg(pile n)

Counted with β electroscope

K.J.Bobin, E.E.Lockett, quoted by E.E.Lockett, R.H.Thomas, Nucleonics 11, No. 3, 14(1953).

τ	$9.45^m \pm 0.03$	Mg(pile n)

Counted with β electroscope

B.W.Sargent, L.Yaffe, A.P.Gray, Can. J. Phys. 31, 235(1953).

Levels	Mg^{26}(d,p)		$E_d = 8$	pc
d,p(θ) 2.8 †	g.s.	$l_n = 0$		
4.6 †	(0.99)	$l_n = 2$		
	3.50	$l_n = 0$		

J.R.Holt, T.N.Marsham, Proc. Phys. Soc. 66A, 258(1953).

$_{12}\mathrm{Mg}^{28}_{16}$

τ	21.3^h	p 2.3^mAl	Mg(39-Mev α)
			Si(≤100-Mev γ) chem

R.K.Sheline, N.R.Johnson, Phys. Rev. 89, 520(1953).

τ	21^h	p 2.3^mAl	Cl(340-Mev p),
β^-	~0.4		chem
γ	<0.1		

M.Lindner, Phys. Rev. 89, 1150(1953).

$_{13}\mathrm{Al}^{25}_{12}$

Levels	Mg^{24}(d,n)		$E_d = 3.97$	ppl
d,n(θ)	g.s.	$l_p = 2$		
	0.45	$l_p = 0$		
	0.95	$l_p = 1$ or 2		
	1.81			
	1.94 ?			
	2.51			
	2.70			
	2.92 ?			
	3.09			

E.Goldberg, Phys. Rev. 88, 159A(1952); 89, 760 (1953).

Capture γ's	Mg(p,γ)	$E_p = 0.27$	scin
~6 †	0.48		
6 †	1.95		
2 †	2.35		

No higher energy γ's observed

H.Casson, Phys. Rev. 87, 215A(1952); 89, 809 (1953).

$_{13}\mathrm{Al}^{27}_{14}$

Level	Al^{27}(p,p)	$E_p = 2.31$	EA
	0.843		

D.J.Donahue, K.W.Jones, M.T.McEllistrem, H.T. Richards, Phys. Rev. 89, 824(1953).

Levels	Al^{27}(n,n'γ)	$E_n = 2.5$	scin
γ	0.843		
	1.018		
	2.20		

R.B.Day, Phys. Rev. 89, 908A(1953).

$_{14}\mathrm{Si}^{28}_{14}$

Capture γ's	Al^{27}(p,γ)		$E_p = 0.325, 0.404$	
12 †	1.81	~14 † {	7.1	scin
12 †	2.82		7.5	
5 † {	4.65			
	5.0			

H.Casson, Phys. Rev. 87, 215A(1952); 89, 809 (1953).

$_{14}\mathrm{Si}^{29}_{15}$

Levels	Si^{28}(d,p)Si^{29}		$E_d = 8$	pc
d,p(θ)	Level	l_n		
	g.s.	0		
	(1.28)	2		
	(2.03)	2		
	(3.07)	2		
	(3.62)	3		
	(4.93)	1		
	(6.38)	1		

J.R.Holt, T.N.Marsham, Phys. Rev. 89, 665(1953).

Si^{32} 14 18

τ $\leqslant 2.6^h$ or $> 100^y$ Cl(340-Mev p), chem

$2.6^h Si^{31}$ observed in high abundance

M.Lindner, Phys. Rev. 89, 1150(1953).

P^{30} 15 15

τ 2.52^m Al(α,n)

K.Baskova, A.Kudriavtseva, Zhur. Ekspti' i Teoret. Fiz. 23, 483(1952).

P^{32} 15 17

τ $14.50^d \pm 0.04$ P(pile n)

Counted for 5 half-lives with β electroscope

No estimate of P^{33} contamination given

E.E.Lockett, R.H.Thomas, Nucleonics 11, No. 3, 14(1953).

$\bar{E}_\beta = 0.694 \pm 0.025$ ic and 4π counter

J.M.Brabant, L.W.Cochran, R.S.Caswell, BAPS 28, 2, DA 5(1953).

Continuous γ spectrum scin

$\gamma(E_\gamma > 0.09)/\beta^- = 0.0023$

P.Boigiano, L.Madansky, F.Rasetti, Phys. Rev. 89, 679(1953).

S^{32} 16 16

Level S(n,nγ) $E_n = 2.5$ scin

γ 2.23

R.B.Day, Phys. Rev. 89, 908A(1953).

S^{33} 16 17

Levels S^{32}(d,p)S^{33} $E_d = 8$ pc

d,p (θ)

Level	l_n
g.s.	2
(0.85)	0
(2.90)	3
(3.28)	1
(4.21)	1
(4.89)	1
(5.72)	1

J.R.Holt, T.N.Marsham, Phys. Rev. 89, 665(1953).

Cl^{33} 17 16

Levels S(d,n) $E_d = 8$ ppl

d,n(θ)

g.s.	$l_p = 2$
0.76	$l_p = 0$
~1.89	
2.84	$l_p = 1$
4.22	$l_p = 1$

R.Middleton, F.A.El-Bedewi, C.T.Tai, Proc. Phys. Soc. 66A, 95(1953).

Cl^{35} 17 18

μ 0.82111 I

$\nu(Cl^{35})/\nu(Rb^{85}) = 1.01481 \pm 0.00005$

$\mu(Cl^{35})/\mu(Cl^{37}) = 1.20128 \pm 0.00006$

LiCl, RbCl

Y.Ting, D.Williams, Phys. Rev. 89, 595(1953).

Cl^{37} 17 20

μ 0.68352 I

$\nu(Cl^{37})/\nu(Rb^{85}) = 0.84477 \pm 0.00005$

LiCl, RbCl

Y.Ting, D.Williams, Phys. Rev. 89, 595(1953).

K^{42} 19 23

I 2 M

μ −1.137

$\Delta F = \pm 1$, $\Delta m = \pm 1$ transitions studied

$\Delta\nu(K^{42})/\Delta\nu(K^{39}) = 1258.9/461.75$

$\mu(K^{39}) = 0.391$

E.H.Bellamy, K.F.Smith, Phil. Mag. 44, 33(1953).

Ca^{45} 20 25

τ 164^d Ca(pile n)

C.F.G.Delaney, J.H.J.Poole, Phys. Rev. 89, 529 (1953).

Sc^{41} 21 20

τ 0.873^s Ca(30-Mev p) scin

W.M.Martin, S.W.Breckon, Can. J. Phys. 30, 643 (1952)

Sc^{46} 21 25 85^d

β^- $\leqslant 0.1\%$ $\leqslant 1.2$ Sπ

γ (0.88) $\alpha = 1.9 \times 10^{-4}$

(1.11) $\alpha = 0.88 \times 10^{-4}$

J.A.Whalen, F.T.Porter, C.S.Cook, Phys. Rev. 89, 902A(1953).

γ (0.88) $\tau < 2^{\mu s}$ $\beta\gamma$

(1.11) $\tau < 2^{\mu s}$ $\beta\gamma$

S.Koicki, R.Ballini, R.Chaminade, Compt. rend. 236, 1155(1953).

γ 0.885 Sc(pile n)

1.119 s$\pi\sqrt{2}$ pe$^-$

T.Lindquist, Arkiv Fysik 6, 123(1953).

Capture γ's Sc^{45}(n,γ) pair s

2^+	6.35	5^+	8.18
2.5^+	6.84	1^+	8.31
0.7^+	7.15	2.5^+	8.54
1^+	7.65	0.3^+	8.85

$^+$Photons per 100 n captures

G.A.Bartholomew, B.B.Kinsey, Phys. Rev. 89, 386 (1953).

Ti

Capture γ Ti(n,γ) pair s

1.4^+ 4.67

Isotopic assignment uncertain

$^+$Photons per 100 n captures

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

Ti^{48} 22 26

Capture γ's Ti(n,γ) pair s

1.5^+ 7.38 ?

0.4^+ 8.27 ?

0.1^+ 9.39 ?

Assignment assuming n binding = 11.63, 9.39γ to 2.31β decay level

$^+$Photons per 100 n captures in Ti

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

Ti^{49} 22 27

Capture γ's Ti(n,γ) pair s

5+	4.88
3.5+	4.96
0.4+	5.65 ?
32+	6.412
4+	6.53
53+	6.756

Assignment from agreement with d,p results
+Photons per 100 n captures in Ti

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

Ti^{50} 22 28

Capture γ's Ti(n,γ) pair s

53+	6.756 ? (also Ti^{49})
0.8+	7.80 ?
0.2+	9.19 ?

Assignment assuming n binding = 10.8, 9.19γ to 1.58 d,p level
+Photons per 100 n captures in Ti

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

Ti^{51} 22 29

τ $5.79^m \pm 0.03$ Ti(pile n)
Counted for 8 half-lives in β electroscope

B.W.Sargent. L.Yaffe, A.P.Gray, Can. J. Phys. 31, 235(1953).

τ 5.9^m
Mass assignment confirmed by Ca^{48}(20-Mev α), Ti^{50}(slow n), Cr^{54}(fast n), V^{51}(fast n)

W.R.Hammond, D.N.Kundu, M.L.Pool, Phys. Rev. 90, 157(1953).

V^{46} 23 23

τ 0.40^s Ti(15-Mev p)
β^+ ~6 scin bias

W.M.Martin, S.W.Breckon, Can. J. Phys. 30, 643 (1952).

V^{51} ? 23 28

Capture γ's V(n,γ) pair s

0.3+	7.67
1.3+	7.83
0.5+	7.98

E_γ greater than V^{51} n binding
γ intensity implies $\sigma_a(V^{50}) = 40-400$
+Photons per 100 n captures in V

G.A.Bartholomew, B.B.Kinsey, Phys. Rev. 89, 386 (1953).

V^{52} 23 29

τ $3.76^m \pm 0.02$ V^{51}(pile n)
Counted for 5 half-lives in β electroscope

B.W.Sargent, L.Yaffe, A.P.Gray, Can. J. Phys. 31, 235(1953).

Levels V^{51}(d,p) $E_d = 7.8$ pc
d,p(θ)

g.s.	$l_n = 1(\geq 75\%)$, $3(\leq 25\%)$
(0.79)	$l_n = 1$
(1.6)	$l_n = 1$

J.S.King, W.C.Parkinson, Phys. Rev. 89, 1080 (1953); BAPS 28, 1, W9(1953).

V^{52} 23 29

Capture γ's V(n,γ) pair s

2+	3.39	10+	5.511
3+	3.59	9+	5.744
3+	3.73	3+	5.88
4+	4.15	25+	6.508
3+	4.45	0.7+	6.62
2+	4.85	14+	6.868
2+	4.98	18.5+	7.154
6+	5.21	11+	7.305

+Photons per 100 n captures in V

G.A.Bartholomew, B.B.Kinsey, Phys. Rev. 89, 386 (1953).

Cr

Capture γ's Cr(n,γ) pair s

0.5+	3.72	3.0+	6.644
0.6+	4.83	0.6+	6.872
1+	5.26	2.6+	7.097
2+	5.61	0.2+	7.21
1+	6.00	0.2+	7.54
0.7+	6.12	0.2+	7.67
0.9+	6.26	7+	8.499
0.3+	6.358		

Isotopic assignment uncertain
+Photons per 100 n captures

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

Cr^{51} 24 27

γ 0.330 pc
No lower energy γ

A.L.Cockroft, quoted by S.C.Curran, Physica 18, 1161(1953).

Cr^{53} 24 29

Levels Cr^{52}(d,p) $E_d = 10.2$ ppl

0.54	3.20
0.97	3.65
1.29	4.10
2.66	

C.E.McFarland, M.M.Bretscher, F.B.Shull, Phys. Rev. 89, 892A(1953).

Capture γ's Cr(n,γ) pair s

3+	7.364
[illegible]+	7.929

Assignment from agreement with d,p results
+Photons per 100 n captures in Cr

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

No reaction Fe(th n,σ) $\sigma < 10^{-5}$ ppl

H.Faraggi, J. phys. radium 14, 160(1953).

Cr^{54} 24 30

Capture γ's Cr(n,γ) pair s

19+	8.881
7+	9.716

Assignment from masses and Mn^{54} 0.835γ
+Photons per 100 n captures in Cr

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

Mn^{50} 25 25

τ 0.28^{s} Cr(17-Mev p)
β^{+} $\sim$6.3 scin bias

W.M.Martin, S.W.Breckon, Can. J. Phys. 30, 643 (1952).

Mn^{55} 25 30

q $\sim$0.5 Mic

A.Javan, G.Silvey, C.H.Townes, A.V.Grosse, BAPS 28, 2, J8(1953).

Mn^{56} 25 31

τ $2.576^{h} \pm 0.002$ Mn(th n)
Counted for 11 half-lives 4π counter

R.M.Bartholomew, R.C.Hawkins, W.F.Merritt, L.Yaffe, Can. J. Chem 31, 204(1953).

τ $2.574^{h} \pm 0.003$ Mn(pile n)
Counted for 4 half-lives with β electroscope

E.E.Lockett, R.H.Thomas, Nucleonics 11, No. 3, 14(1953).

Capture γ's $Mn^{55}(n,\gamma)$ pair s

1^{+}	3.82	0.3^{+}	5.63
1^{+}	4.10	1^{+}	5.77
2^{+}	4.24	0.5^{+}	5.91
2^{+}	4.55	1^{+}	6.11
2^{+}	4.72	0.5^{+}	6.43
2^{+}	4.81	2.5^{+}	6.779
6^{+}	5.04	6.5^{+}	7.048
3^{+}	5.21	4^{+}	7.15
4^{+}	5.53	12^{+}	7.261

$^{+}$Photons per 100 n captures

G.A.Bartholomew, B.B.Kinsey, Phys. Rev. 89, 386 (1953).

Fe

γ's Fe(n,nγ) E_n = 14 scin
3.3
4.4
5.8
7.1
8.75
Spectrum continuous below 3 Mev

V.E.Scherrer, R.Theus, W.R.Faust, Phys. Rev. 89, 1268(1953).

Capture γ's Fe(n,γ) pair s

2.0^{+}	3.43
0.5^{+}	3.86
2^{+}	4.21
1^{+}	4.44
1^{+}	4.81
0.4^{+}	6.369

Isotopic assignment uncertain
$^{+}$Photons per 100 n captures

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

Fe^{55} 26 29

E_{dis} 0.20 scin
from continuous γ endpoint

P.Boigiano, L.Madansky, F.Rasetti, Phys. Rev. 89, 679(1953).

E_{dis} 0.22 scin
from continuous γ endpoint

A.Michalowicz, J. phys. radium 14, 214(1953).

Fe^{55} 26 29

No e^{-} ($< 6 \times 10^{-5}$%) between 0.030 and 0.20
Mn^{55}(10-Mev d,2n) chem

F.T.Porter, H.P.Hotz, Phys. Rev. 89, 938(1953).

Capture γ's Fe(n,γ) pair s
0.8^{+} 8.345
0.5^{+} 8.872
2.7^{+} 9.298 (also Fe^{58} ?)
Assignment from agreement with d,p and p,n results
$^{+}$Photons per 100 n captures in Fe

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

Fe^{56} 26 30

γ Fe(n,nγ) E_n = 1.23 scin
(0.85)

B.Rose, J.M.Freeman, Proc. Phys. Soc. 66A, 120 (1953).

γ's Fe(n,nγ) E_n = 14 scin
0.85
1.25

L.C.Thomp..., Phys. Rev. 89, 905A(1953).

γ's Fe(n,nγ) E_n = 2.5 scin
0.85
1.25
1.42 (Fe^{57}?)

R.B.Day, Phys. Rev. 89, 908A(1953).

Fe^{57} 26 31

Capture γ's Fe(n,γ) pair s
0.5^{+} 4.968
5.2^{+} 5.914
5.6^{+} 6.015
3.5^{+} 7.285
36^{+} 7.639
Assignment from agreement with d,p results
$^{+}$Photons per 100 n captures in Fe

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

Fe^{58} 26 32

Capture γ's Fe(n,γ) pair s
2.7^{+} 9.298 (also Fe^{55} ?)
0.1^{+} 10.16
Assignment from masses and Co^{58} decay
$^{+}$Photons per 100 n captures in Fe

B.B.Kinsey, G.A.Bartholomew, Phys, Rev. 89, 375 (1953).

Fe^{59} 26 33

γ 58^{+} 1.10 sπ cpt
42^{+} 1.28
No other γ (0.5 to 2.1) < 10%

B.S.Dzhelepov, N.N.Zhukovskii, V.V.Khol'nov, Doklady Akad. Nauk SSSR 86, 497(1952).

Co^{54} 27 27

τ $\sim 0.18^{s}$ Fe(17-Mev p)
β^{+} $\sim$7.4 scin bias

W.M.Martin, S.W.Breckon, Can. J. Phys. 30, 643 (1952).

Co^{57} 27 30

I 7/2 para
μ 4.6

J.M.Baker, B.Bleaney, K.D.Bowers, P.F.D.Shaw, R.S.Trenam, Proc. Phys. Soc. 66A, 305(1953).

Co^{58} 27 31 72^d

τ 72^d d 9.2^hCo chem

D.C.Hoffman, D.S.Martin Jr., J. Phys. Chem. 56, 1097(1952).

Co^{60} 27 33 5.2^y

τ_2 $4.95^y \pm 0.04$ Co(pile n)
Counted for 8 months with β electroscope

E.E.Lockett, R.H.Thomas, Nucleonics 11, No. 3, 14(1953).

γ 1.1728 K/LM~10 sπ ce_K^-
1.3325 K/LM~10
Energy calibration from authors' new absolute measurement of 1.12 and 1.41 γ's of Bi^{214}

G.Lindström, A. Hedgran, D.E.Alburger, Phys. Rev. 89, 1303(1953).

$\gamma\gamma(\theta)$, $\gamma\gamma$ polarization-direction
I = 4+, 2+, 0+

J.J.Kraushaar, M.Goldhaber, Phys. Rev. 89, 1081 (1953).

Co^{60} 27 33

Capture γ's $Co^{59}(n,\gamma)$ pair s

1^+	3.36	5.6^+	5.966
0.7^+	3.69	0.5^+	6.11
1^+	4.03	0.7^+	6.250
0.8^+	4.18	5^+	6.474
1^+	4.37	6^+	6.690
0.6^+	4.59	7^+	6.867
2.5^+	4.903	2.5^+	6.97
2^+	5.18	1.3^+	7.04
0.7^+	5.35	4.0^+	7.201
6.3^+	5.646	3.0^+	7.486
1.7^+	5.73		

$^+$Photons per 100 n captures

G.A.Bartholomew, B.B.Kinsey, Phys. Rev. 89, 386 (1953).

Ni

Capture γ's Ni(n,γ) pair s

3^+	5.82	9^+	6.84
0.3^+	5.99	0.5^+	7.05
1.0^+	6.10	0.5^+	7.22
0.6^+	6.34	2.8^+	8.12
2.0^+	6.58		

Isotopic assignment uncertain
$^+$Photons per 100 n captures

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

Ni^{59} 28 31

Levels $Ni^{58}(d,p)$ E_d = 10.2 ppl
0.42 5.20
3.08 5.66
4.57

C.E.McFarland, M.M.Bretscher, F.B.Shull, Phys. Rev. 89, 892A(1953).

Ni^{59} 28 31

Capture γ's Ni(n,γ) pair s
1^+ 5.31
0.4^+ 5.70
14^+ 8.532 (also Ni^{61} ?)
35^+ 8.997
Assignment from agreement with d,p results
$^+$Photons per 100 n captures in Ni

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

Ni^{61} 28 33

Capture γ's Ni(n,γ) pair s
4^+ 7.528
6.5^+ 7.817
14^+ 8.532 (also Ni^{59} ?)
Assignment from agreement with d,p results and Cu^{61}decay
$^+$Photons per 100 n captures in Ni

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

Ni^{63} 28 35

F-K plot concave toward energy axis below 30 kev although S^{35} and Pm^{147} plots linear to 10 kev

J.P.Mize, D.J.Zaffarano, BAPS 28, 2, DA 6(1953).

Cu

Capture γ's Cu(n,γ) pair s

0.7^+	5.07	0.2^+	5.75
0.6^+	5.18	1^+	6.05
1^+	5.31	1^+	6.41
1^+	5.43	1^+	7.16
0.5^+	5.64		

Isotopic assignment uncertain
$^+$Photons per 100 n captures

G.A.Bartholomew, B.B.Kinsey, Phys. Rev. 89, 386 (1953).

Cu^{58} 29 29

τ 3.04^s - Ni(15-Mev p)

W.M.Martin, S.W.Breckon, Can. J. Phys. 30, 643 (1952).

Cu^{64} 29 35

Capture γ's Cu(n,γ) pair s
3^+ 6.69
2^+ 7.01
5.5^+ 7.296
20^+ 7.914
Assignment from agreement with d,p results
$^+$Photons per 100 n captures in Cu

G.A.Bartholomew, B.B.Kinsey, Phys. Rev. 89, 386 (1953).

Cu^{66} 29 37

τ 5.10^m Cu(slow n)
Counted with β electroscope

B.W.Sargent, L.Yaffe, A.P.Gray, Can. J. Phys. 31, 235(1953).

Capture γ Cu(n,γ) pair s
9^+ 7.634 ?
Assignment from agreement with unpublished d,p results, but disagrees with $Zn^{66}(\gamma,n)$
$^+$Photons per 100 n captures in Cu

G.A.Bartholomew, B.B.Kinsey, Phys. Rev. 89, 386 (1953).

Zn — Capture γ's — Zn(n,γ) — pair s

1.2^+	4.14	0.3^+	6.26
1.6^+	4.84	1^+	6.49
0.7^+	5.23	0.5^+	6.65
2.5^+	5.48	2.7^+	6.94
1^+	5.77	2.0^+	7.19
0.8^+	6.03		

Isotopic assignment uncertain
$^+$Photons per 100 n captures

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

Zn^{62} (30 32)
τ — 8.4^h — Ni(13-Mev He^3)

D.N.Kundu, T.W.Donaven, M.L.Pool, J.K.Long, Phys. Rev. 89, 1201(1953); Physica 18, 1304 (1952).

Zn^{65} (30 35)
γ — 0.20 ? — scin
$1.11\gamma/\beta^+ = 38$ $\quad 0.20\gamma/\beta^+ = 0.5$

R.Bouchez, N.Perrin, quoted by R.Bouchez, Physica 18, 1171(1952).

Capture γ — Zn(n,γ) — pair s
10^+ — 7.876
Assignment from agreement with d,p results
$^+$Photons per 100 n captures in Zn

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

Zn^{68} (30 38)
Capture γ's — Zn(n,γ) — pair s

0.6^+	8.31
0.2^+	8.58
0.2^+	8.98
1^+	9.12
0.07^+	9.51

Assigned here since $E_\gamma >$ n binding in other Zn's
$^+$Photons per 100 n captures in Zn

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953)

Zn^{69} (30 39) 13.8^h
γ — 0.435 — $\alpha = 0.06$ — sl ce$^-$, scin

R.B.Duffield, L.M.Langer, Phys. Rev. 89, 854 (1953).

52^m
β^- — 100% — 0.897 — sl

R.B.Duffield, L.M.Langer, Phys. Rev. 89, 854 (1953).

Ga^{65} (31 34)
τ — 15^m — Cu(21-Mev He^3)
β^+ — 2.1

M.L.Pool, Physica 18, 1304(1952).

β^+ — 2.2 — Zn(6-Mev d) — chem; a

A.H.W.Aten, Jr., H.de Wijs, M.Boelhouwer, Physica 18, 1032(1952).

Ga^{67} (31 36)
γ — (0.092) — $\tau \sim 350^{\mu s}$ — scin
(0.18γ) (0.30γ) — Cu(21-Mev He^3)

M.L.Pool, Physica 18, 1304(1952).

Ge^{78} (32 46)
τ — 86^m — U^{235}(pile n,f) chem; pc

N. Sugarman, Phys. Rev. 89, 570(1953).

As^{70} (33 37)
τ — 52^m — Ge(26-Mev d) — chem
β^+ — 2.7 — a
γ — 1.04* — scin
1.7 ?*
2.0*
$K/\beta^+ < 0.2$ $\quad \gamma/\beta^+ \sim 2$

B.Verkerk, A.H.W.Aten, Jr., Physica 18, 974(1952); *A.H.Wapstra, N.F.Verster, ibid.

As^{75} (33 42)
μ — 1.43524 — I
$\nu(As^{75})/\nu(D) = 1.11569 \pm 0.00005$
Na_2HAsO_4, D_2O

Y.Ting, D.Williams, Phys. Rev. 89, 595(1953).

As^{76} (33 43)
γ — 0.56 — (E)2 — $\gamma\gamma(\theta)$
0.65 — (M)1 (20-66%) — $\gamma\gamma(\theta)$
1.21
2.1
$(0.65\gamma)(0.56\gamma)(\theta)$ — I = 2,2,0 — As(slow n) scin

J.J.Kraushaar, M.Goldhaber, Phys. Rev. 89, 1081 (1953).

As^{77} (33 44)
τ — 38.0^h — U^{235}(pile n,f) chem; pc

N.Sugarman, Phys. Rev. 89, 570(1953).

As^{78} (33 45)
τ — 91.0^m — d $86^m Ge^{78}$ — U^{235}(pile n,fβ^-)
No $\sim 40^m$ activity observed — chem; pc

N.Sugarman, Phys. Rev. 89, 570(1953).

Br^{79} (35 44)
$\mu(Br^{81})/\mu(Br^{79}) = 1.07794$ — M
q — 0.335
$q(Br^{79})/q(Br^{81}) = 1.19707$

J.G.King, V.Jaccarino, BAPS 28, 2, DA1(1953).

Br^{81} (35 46)
$\mu(Br^{81})/\mu(Br^{79}) = 1.07794$ — M
q — 0.280
$q(Br^{79})/q(Br^{81}) = 1.19707$

J.G.King, V.Jaccarino, BAPS 28, 2, DA1(1953).

Br^{87} (35 52)
n — 2% — U(n,f) chem
β^- — 70% — 2.6 — a$\beta\gamma$
30% — 8.0 — a
γ — 80^+ — 2 - 4
20^+ — 5.4

A.F.Stehney, N.Sugarman, Phys. Rev. 89, 194(1953).

Rb^{82} ? (37 45)
τ — 76^s — d 25.5^dSr — a
β^+ — 4.2
β^+ observed in 25.5^dSr but assigned here

P.Kruger, N.Sugarman, Phys. Rev. 90, 158(1953).

Rb^{84} 37 47 · 23^m

τ_1 21^m Rb(fast n) ion chem

γ 25^+ 0.239 scin

10^+ 0.463

$(0.23\gamma)(0.23\gamma)$ No $(0.23\gamma)(0.46\gamma)$ scin

No x rays observed pc

R.S.Caird, A.C.G.Mitchell, Phys. Rev. 89, 573 (1953).

Sr^{82} ? 38 44

τ 25.5^d Ag(450-Mev p) chem

Parent 76^sRb; not p 6.3^hRb ($<1\%$) chem

P.Kruger, N.Sugarman, Phys. Rev. 90, 158(1953).

Sr^{89} 38 51

Levels Sr(d,p) $E_d = 10.4$ s

1.07

2.07

2.54

C.E.McFarland, F.B.Shull, Phys. Rev. 89, 489(1953).

Sr^{91} 38 53

β^- 7% 0.62 U(n,f) sπ

33% 1.093

29% 1.355

5% 2.03

26% 2.665 $\Delta I = 2$, yes shape

γ 0.5512 K/LM = 6.0

0.63

0.747

1.025

1.413

D.P.Ames, M.E.Bunker, L.M.Langer, B.M.Sorenson, Phys. Rev. 89, 903A(1953).

Y^{91} 39 52 · 51^m

τ_1 50.3^m d 9.7^hSr

D.P.Ames, M.E.Bunker, L.M.Langer, B.M.Sorenson, Phys. Rev. 89, 903A(1953).

57^d

τ_2 61^d

β^- 1.54 $\Delta I = 2$, yes shape scin

1.16γ observed with $\tau \sim 160^d$ No$(1.16\gamma)(\beta)$

F.I.Boley, D.S.Dunavan, Phys. Rev. 90, 158(1953).

Continuous γ spectrum scin

$\gamma(E_\gamma > 0.09)/\beta^- = 0.0019$

P.Bolgiano, L.Madansky, F.Rasetti, Phys. Rev. 89, 679(1953).

Y^{92} 39 53

Mass assignment of 3.5^h activity confirmed from Zr(7.8-Mev d,α) yields

G.L.Schott, W.W.Meinke, Phys. Rev. 89, 1156(1953).

Y^{94} 39 55

Mass assignment of 16.5^m activity confirmed from Zr(7.8-Mev d,α) yields

G.L.Schott, W.W.Meinke, Phys. Rev. 89, 1156(1953).

Zr^{89} 40 49 · 4.5^m

τ_1 4.25^m Zr($\leq$ 24-Mev γ)

L.Katz, R.G.Baker, R.Montalbetti, Can. J. Phys. 31, 250(1953).

80^h

τ_2 78^h Zr($\leq$ 24-Mev γ)

L.Katz, R.G.Baker, R.Montalbetti, Can. J. Phys. 31, 250(1953).

Zr^{95} 40 55

β^- 99% 0.370 Zr(pile n) ion chem

1% 0.84 s

γ 0.721 $\alpha = 0.0024$ s pe$^-$, ce$^-$

No 0.92γ

H.Slätis, L.Zappa, Arkiv Fysik 6, 81(1953).

β^- 54% 0.364 s

43% 0.396

γ 0.722 $\alpha_K = 0.0014$* s ce$^-$

0.754 $\alpha_K = 0.0011$*

$\beta\gamma(\theta)$ $b = 0.00 \pm 0.03$

P.S.Mittelman, BAPS 28, 3, U10(1953); *verbal report.

γ 0.73 U(n,f) chem; scin

$(\beta)(0.73\gamma)$ indicates $\gamma/\beta \sim 1$

C.E.Mandeville, E.Shapiro, R.I.Mendenhall, E.R. Zucker, G.L.Conklin, Phys. Rev. 89, 559(1953).

Nb^{90} 41 49

τ 14.7^h d 5.7^hMo chem

β^+ 1.2 Al a

Absorption due to x rays, β^+ or both

R.M.Diamond, Phys. Rev. 89, 1149(1953).

Nb^{95} 41 54 · 90^h

τ_1 84^h d 65^dZr chem

γ 0.231 s ce$^-$

H.Slätis, L.Zappa, Arkiv Fysik 6, 81(1953).

35^d

β^- 0.159 d 65^dZr chem

γ 0.745 $\alpha = 0.0024$ s; ce$^-$

H.Slätis, L.Zappa, Arkiv Fysik 6, 81(1953).

β^- 0.171 sl

γ 0.771 $\alpha = 0.0018$ K/LM = 2.4*

E.F.Strucken, A.H.Weber, BAPS 28, 3, U11(1953); *verbal report.

γ 0.774 K/LM = 6.6 s ce$^-$

R.E.Maerker, R.D.Birkhoff, Phys. Rev. 89, 1159 (1953).

γ 0.76 d 65^dZr chem; scin

$(\beta)(0.76\gamma)$ indicates $\gamma/\beta \sim 1$

C.E.Mandeville, E.Shapiro, R.I.Mendenhall, E.R. Zucker, G.L.Conklin, Phys. Rev. 89, 559(1953).

γ 0.764 s ce$^-$

P.S.Mittelman, BAPS 28, 3, U10(1953).

Mo^{90} 42 48

τ 5.7^h Nb^{93}(55-Mev p) chem

β^+ ~1.4?* Al a

γ ~0.12 Pb a

~0.25

1.1

*Absorption due to x rays, β^+ or both

R.M.Diamond, Phys. Rev. 89, 1149(1953).

Mo^{91} 42 49 · 75^s

τ_1 65.5^s Mo($\leq$ 24-Mev γ)

$\sigma(65.5^s)/\sigma(15.5^m) = 0.2$ for $E_\gamma = 16$-20 indicating 65.5^s state has larger spin

L.Katz, R.G.Baker, R.Montalbetti, Can. J. Phys. 31, 250(1953).

$_{42}Mo^{91}_{49}$
75^s

No 65.5^s activity from Mo (14.4-Mev n,2n); weak activity from Mo (18-Mev n,2n)

J.E.Brolley, Jr., Phys. Rev. 89, 877(1953); 88, 618(1952).

16^m

τ_2 15.5^m Mo($\leqslant$ 24-Mev γ)
β^+ 3.3 a
65.5^s level 0.15 $\pm$0.05 Mev above 15.5^m g.s. from Mo(γ,n) thresholds

L.Katz, R.G.Baker, R.Montalbetti, Can. J. Phys. 31, 250(1953).

Mo^{93}
42 51
6.7^h

Mass assignment of 6.7^h activity confirmed with ms Nb(6.7-Mev d) chem
γ 0.27 scin
0.70
1.5

R.Bernas, J.Beydon, Compt. rend. 236, 194(1953).

Mass assignment of 6.7^h activity confirmed with ms Nb(25-Mev d)
γ 0.264 K/LM=2.8 L/M~3 $s\pi\sqrt{2}$ ce$^-$
0.685 pe$^-$
1.479 pe$^-$

D.E.Alburger, S.Thulin, Phys. Rev. 89, 1146(1953).

Tc^{93}
43 50
44^m

τ_1 43.5^m Mo^{92}(9.5-Mev p) chem
γ 0.390 α_K = 0.31 K/LM = 5.8 M4 $s\pi\sqrt{2}$ ce$^-$, pe$^-$
Assignment from Nb^{93}(39-Mev α), Mo(~0 to 20-Mev d); formerly assigned to Tc^{92}

H.T.Easterday, H.A.Medicus, Phys. Rev. 89, 752 (1953).

Tc^{96}
43 53
52^m

τ_1 52^m Nb^{93}(13.5-Mev α) $s\pi\sqrt{2}$ ce$^-$
β^+ ~0.01%
γ I.T. 0.034 K/L = 1.2
Assignment from Mo^{96} (9.5-Mev p), Mo(4-Mev p); formerly assigned to Tc^{94}

H.T.Easterday, H.A.Medicus, Phys. Rev. 89, 752 (1953).

Ru^{103}
44 59

γ (0.499) $\tau < 2 \times 10^{-9 s}$ $\beta\gamma$

T.C.Engelder, Phys. Rev. 90, 259(1953).

Rh^{97} ?
45 52

τ 31^m Ru(28-Mev d) chem
β^+

A.H.W.Aten, Jr., H.Cerfontain, W.Dzcubas, T.Hamerling, Physica 18, 972(1952).

Rh^{98} ?
45 53

τ 9^m Ru(28-Mev d) chem
β^+ s

A.H.W.Aten, Jr., H.Cerfontain, W.Dzcubas, T.Hamerling, Physica 18, 972(1952).

Rh^{106}
45 61

γ 100 † 0.51 scin
53 † 0.62
2 † 0.87
7 † 1.04
1 † 1.55
(0.62γ)(0.51γ)(θ) and polarization-direction I = 0+, 2+, 0+
$\gamma\gamma(\theta)$ coefficients 12% lower than theory

J.J.Kraushaar, M.Goldhaber, Phys. Rev. 89, 1081 (1953).

Pd^{105}
46 59

I 5/2 S

J.Blaise, H.Chantrel, J. phys. radium 14, 135 (1953).

Ag^{107}
47 60

$\mu(Ag^{107})/\mu(Ag^{109})$ = 0.86627 M

G.Wessel, H.Lew, BAPS 28, 3, Q8(1953).

Ag^{109}
47 62

$\mu(Ag^{107})/\mu(Ag^{109})$ = 0.86627 M

G.Wessel, H.Lew, BAPS 28, 3, Q8(1953).

Ag^{110}
47 63
270^d

(0.53β)(0.66γ) (0.53β)(0.89γ) (0.53β)(0.94γ)
No (0.53β)(1.52γ) No (0.53β)(1.39γ)
(0.66γ)(0.89γ) (0.66γ)(0.94γ) (0.66γ)(1.39γ)
(0.89γ)(0.94γ) (0.89γ)(1.39γ)
(1.52γ)(0.66γ) (1.52γ)(0.76γ) No (1.52γ)(0.89γ)
Results in agreement with Siegbahn decay scheme

S.A.E.Johansson, S.Almquist, Arkiv Fysik 5, 427 (1952).

Ag^{111}
47 64

$\bar{E}_\beta$ = 0.376 $\pm$0.014 ic

J.M.Brabant, L.W.Cochran, R.S.Caswell, BAPS 28, 2, DA5(1953).

Cd^{111}
48 63

Levels Cd(n,n')49^{m}Cd E_n = 0.1 to 1.4
0.72
0.95 ?
1.15
Absolute σ consistent with I = 11/2 for 49^{m}Cd from statistical model

A.E.Francis, J.J.McCue, C.Goodman, Phys. Rev. 89, 1232(1953).

Cd^{117}
48 69
2.8^h

τ_1 3.0^h Cd(n,γ) Cd(d,p) U(n,f)
β^- weak if present

C.D.Coryell, P.Lévêque, H.G.Richter, Phys. Rev. 89, 903A(1953).

~50^m

τ_2 ~50^m Cd(n,γ) Cd(d,p) U(n,f)
β^- and γ p ~2^{h}In ?

C.D.Coryell, P.Lévêque, H.G.Richter, Phys. Rev. 89, 903A(1953).

Cd^{118}
48 70

τ ~30^m U(n,f)
β^- a
Not p 4.5^{m}In

C.D.Coryell, P.Lévêque, H.G.Richter, Phys. Rev. 89, 903A(1953).

$In^{111}_{49\ 62}$

$\gamma\gamma(\theta)$ b = - 0.19 liquid sample
b depends on phase not chemical structure

R.M.Steffen, Phys. Rev. 89, 903A(1953).

$In^{113}_{49\ 64}$

μ 5.4966 $In(NO_3)_3$; I
$\mu(In^{113})/\mu(In^{115}) = 0.99787 \pm 0.00004$

Y.Ting, D.Williams, Phys. Rev. 89, 595(1953).

$In^{114}_{49\ 65}$ 72^s

β^- 2.01 50^d In; s

V.S.Shpinel, N.V.Forafontov, Zhur. Eksptl' i Teoret. Fiz. 21, 1376(1951).

$In^{115}_{49\ 66}$

μ 5.5083 $In(NO_3)_3$ $ScCl_3$; I
$\nu(In^{115})/\nu(Sc^{45}) = 0.901877 \pm 0.00005$

Y.Ting, D.Williams, Phys. Rev. 89, 595(1953).

$In^{116}_{49\ 67}$ 54^m

τ_1 $54.14^m \pm 0.07$ In(pile n)
Counted for 5 half-lives with G-M

K.W.Downes, G.A.Price, R.Sher, V.J.Walsh, BNL-216 (T-33).

$In^{117}_{49\ 68}$ 70^m

τ_1 70^m U(n,f)
β^- and weak γ a

C.D.Coryell, P.Lévêque, H.G.Richter, Phys. Rev. 89, 903A(1953).

$\sim 2.5^h$

τ_2 $\sim 2.5^h$ U(n,f)
β^- and very weak γ a

C.D.Coryell, P.Lévêque, H.G.Richter, Phys. Rev. 89, 903A(1953).

$In^{118}_{49\ 69}$ $< 1^m$

τ_2 $< 1^m$ d 30^mCd chem
β^- 4.0 a

C.D.Coryell, P.Lévêque, H.G.Richter, Phys. Rev. 89, 903A(1953).

τ_1 $53.99^m \pm 0.06$ In(pile n)
Counted for 6 half-lives with β electroscope

E.E.Lockett, R.H.Thomas, Nucleonics 11, No. 3, 14(1953).

$Sn^{113}_{50\ 63}$ 112^d

τ 120^d Sn(pile n) chem
No 0.255γ (< 1% of 0.39γ) scin
No 0.401γ (< 10% of 0.39γ)

Y.Deschamps, P.Avignon, Compt. rend. 236, 478 (1953).

No $e^-(0.085\gamma)$ < 1% of $e^-(0.392\gamma)$ sl
No $e^-(0.255\gamma)$ < 1% of $e^-(0.392\gamma)$
$e^-(0.401\gamma)$ not resolvable
$e^-_A/e^-_{KLM}(0.392\gamma) = 0.56$
ϵ_L/ϵ_K = 0.08 to 0.17 (if all ϵ to 0.392 level)
Previous value of 0.8 superseded

C.D.Broyles, D.A.Thomas, S.K.Haynes, Phys. Rev. 89, 715(1953).

$Sb^{121}_{51\ 70}$

Q -1.3 S

G.Sprague, D.H.Tomboulian, BAPS 28, 3, Q11(1953).

$Sb^{123}_{51\ 72}$

Q -1.7 S

G.Sprague, D.H.Tomboulian, BAPS 28, 3, Q11(1953).

$Sb^{124}_{51\ 73}$ 60^d

β^- 14% 0.24 s π
49% 0.61
9% 0.966
7% 1.602
21% 2.317 F-K plot not linear
2.3β $\Delta I = 1$, yes ? Not $\Delta I = 2$, yes
0.603 α=0.0034 K/LM=7.9 E2 ce^-
0.641 pe^-
0.716
1.68
2.09
$(1.68\gamma)(0.60\gamma)$* $(2.09\gamma)(0.60\gamma)$*

R.J.D.Moffat, N.Lazar, L.M.Langer, BAPS 28, 3, U13(1953); *verbal report.

β^- 10% 0.223 S
53% 0.609
6% 0.871
5% 1.581
5% 1.658 F-K plot not linear
21% 2.306 F-K plot not linear
2.3β $\Delta I = 2$, no ? Not $\Delta I = 2$, yes
γ Rel. intensity of ce^-
0.604 K : L : M = 100 : 13 : 3
0.648 K = 5.4
0.711 ?
0.725 K = 7.8
1.697 K = 3.4

E.P.Tomlinson, S.L.Ridgway, K.Gopalakrishnan, BAPS 28, 3, U12(1953); verbal report.

γ 0.607 K/LM $\sim$15 s ce^-

R.E.Maerker, R.D.Birkhoff, Phys. Rev. 89, 1159 (1953).

γ (0.60) $\tau < 2 \times 10^{-9\,s}$ $\beta\gamma$

T.C.Engelder, Phys. Rev. 90, 259(1953).

γ (1.70) (E)1 99.9% $\gamma\gamma(\theta)$
$\alpha = 2.6 \times 10^{-4}$ E1
$(1.70\gamma)(0.60\gamma)(\theta)$ I = 3,2,0
I(2.3 level Te^{124}) = 3 -
$(2.09\gamma)(0.60\gamma)(\theta)$ I = 3,2,0

F.R.Metzger, Phys. Rev. 90, 328(1953).

γ (1.70) (E)1 99.9% $\gamma\gamma(\theta)$
$(1.70\gamma)(0.60\gamma)(\theta)$ I = 3,2,0

J.J.Kraushaar, M.Goldhaber, Phys. Rev. 89, 1081 (1953).

$Te^{123}_{52\ 71}$ 100^d

γ (0.159) $\tau = 1.9 \times 10^{-10\,s}$ $e^-_K e^-_K$

R.L.Graham, R.E.Bell, Can. J. Phys. 31, 377(1953).

$Te^{125}_{52\ 73}$ 58^d

γ (0.035) $\tau = 1.6 \times 10^{-9\,s}$ $e^-_L e^-_L$

R.L.Graham, R.E.Bell, Can. J. Phys. 31, 377(1953).

$_{52}Te^{125}_{73}$

γ 0.0355 $\alpha_K = 160$ pc
K : L : M = 5.4 : 3.6 : 1.0
0.110 $\alpha_K = 11$
K : L : M = 40 : 5.5 : 1.0

J.G.Balfour, quoted by S.C.Curran, Physica 18, 1161(1952).

$_{53}I^{126}_{73}$

β^- 72.5† 0.87 I(28-Mev d); sl
27.5† 1.26
β^+ 2.7† 1.21
γ sl ce$^-$, pe$^-$ scin
0.390 $\alpha_K = 0.016$ K/LM≥8 E2
0.67

$\epsilon_K/(0.67\gamma) \sim 1.25$* $(0.39\gamma)/(0.67\gamma) \sim 1.0$
$(\sim 0.9\beta^-)(0.39\gamma)$ (K x ray) (0.67γ)

*From comparison with Cs^{137} K x ray/γ value

N.Marty, H.Langevin, P.Hubert, Compt. rend 236, 1153(1953).

$_{53}I^{127}_{74}$

|q| 0.69 solid I_2 Mic

T.Kamei, J. Phys. Soc. Japan 7, 649(1952).

$_{53}I^{131}_{78}$

τ $8.05^d \pm 0.01$ U(n,f)

R.M.Bartholomew, F.Brown, R.C.Hawkins, W.F. Merritt, L.Yaffe, Can. J. Chem. 31, 120(1953).

τ $8.06^d \pm 0.02$

E.E.Lockett, R.H.Thomas, Nucleonics 11, No. 3, 14(1953).

γ (0.637) α_K=0.0040 E2 s ce$^-$, pe$^-$
(0.722) α_K=0.0031 E2

J.L.Wolfson, Can. J. Phys. 30, 715(1952).

Mass assignment of 54^m activity confirmed from U(n,f) cumulative yield of 7.7%
(Xe^{132} yield = 4.2%, Xe^{134} yield = 8.2%; ms)

L.Yaffe, A.E.Day, B.A.Greer, Can. J. Chem 31, 48(1953).

Xe

Neutron resonances (ev) E_n = 1.5 ev to 2 kev
9.3
13.9 $\sigma_o\Gamma^2 \sim 1000$

S.P.Harris, Phys. Rev. 89, 904A(1953).

$_{54}Xe^{133}_{79}$

γ (0.08) α_K = 1.8 K/LM = 6 M1
$\tau = 6 \times 10^{-9\,s}$ $\beta^- e^-_K$

R.L.Graham, R.E.Bell, Can. J. Phys. 31, 377(1953).

$_{54}Xe^{135}_{81}$ 9.2^h

τ 9.13^h U(n,f) chem

F.Brown, L.Yaffe, Can. J. Chem. 31, 242(1953).

γ (0.25) $\tau = 2.8 \times 10^{-10\,s}$ $\beta^- e^-_K$
K/LM = 5.6

R.L.Graham, R.E.Bell, Can. J. Phys. 31, 377(1953).

$_{54}Xe^{145}_{91}$

Existence of 0.8^sXe activity in doubt
Previously reported as p $1.8^h Ce^{145}$, q.v.

A.A.Caretto, Jr., S.Katcoff, Phys. Rev. 89, 1267 (1953).

$_{55}Cs^{134}_{79}$ 2.3^y

γ 0.202 0.663 s pe$^-$, ce$^-$
0.475 0.797 K/L = 7.3
0.563 0.803
0.570 1.039
0.605 K/L = 6.4 1.168
1.368

J.M.LeBlanc, W.H.Nester, D.W.Martin, M.K.Brice, J.M.Cork, Phys. Rev. 89, 907A(1953).

γ 0.602 K/LM = 6.6 s ce$^-$
0.799 K/LM = 7.8

R.E.Maerker, R.D.Birkhoff, Phys. Rev. 89, 1159 (1953).

$_{55}Cs^{137}_{82}$

τ 33^y U(n,f) chem ms
Calc. from Cs^{137}/Cs^{133} ratios measured between 4.2 and 5.4 years after fission

D.R.Wiles, B.W.Smith, R.Horsley, H.G.Thode, Can. J. Phys. 31, 419(1953).

β^- 0.512 ΔI = 2, yes shape sl
1.20 ΔI = 2, no

C.D.Broyles, D.A.Thomas, S.K.Haynes, Phys. Rev. 89, 715(1953).

γ 0.663 K/LM = 4.52 s ce$^-$

R.E.Maerker, R.D.Birkhoff, Phys. Rev. 89, 1159 (1953).

$_{55}Cs^{138}_{83}$

τ 32^m U(n,f) chem
β^- 3.40 F-K plot not linear sl
γ 33† 0.463 sl ce, scin
43† 0.98 scin
100† 1.44 scin
$(\sim 3\beta^-)(1.44\gamma\,?)$
$(1.44\gamma)(0.46\gamma\,?)$ $(1.44\gamma)(0.98\gamma\,?)$

L.M.Langer, R.B.Duffield, C.W.Stanley, Phys. Rev. 89, 907A(1953).

$_{56}Ba^{133}_{77}$ 39^h

γ (0.012) $\tau < 0.02^{\mu s}$

H.Langevin, Compt. rend 236, 689(1953).

$_{56}Ba^{140}_{84}$

γ 0.540 K/LM ~ 6 s ce$^-$

R.E.Maerker, R.D.Birkhoff, Phys. Rev. 89, 1159 (1953).

$_{57}La^{140}_{83}$

τ 40.2^h La(pile n)

R.M.Bartholomew, F.Brown, R.C.Hawkins, W.F.Merritt, L.Yaffe, Can. J. Chem. 31, 120(1953).

γ 0.488 K/LM = 3.7 s ce$^-$

R.E.Maerker, R.D.Birkhoff, Phys. Rev. 89, 1159 (1953).

Ce

No fission product Ce with $6^m < \tau < 13.9^m$ chem

A.A.Caretto, Jr., S.Katcoff, Phys. Rev. 89, 1267 (1953).

$_{58}Ce^{141}_{83}$

γ (0.145) $\tau < 2 \times 10^{-9\,s}$ $\beta\gamma$

T.C.Engelder, Phys. Rev. 90, 259(1953).

Ce^{145} 58 87
No 1.8^hCe activity U(n,f) chem
Previously reported activity due to 2.0^hNd impurity?
A.A.Caretto, Jr., S.Katcoff, Phys. Rev. 89, 1267 (1953).

Ce^{146} 58 88
τ 13.9^m p 24.4^mPr U(n,f) chem
β^- ~0.9 a
γ ~0.2 a
A.A.Caretto, Jr., S.Katcoff, Phys. Rev. 89, 1267 (1953).

Pr^{141} 59 82
μ 3.8 M
H.Lew, Phys. Rev. 89, 530(1953).

μ +3.9 S
Calculated from data of White, Phys. Rev. 34, 1397(1929)
P.Brix, Phys. Rev. 89, 1245(1953).

Pr^{144} 59 85
γ (0.695) $\tau < 2 \times 10^{-9s}$ $\beta\gamma$
T.C.Engelder, Phys. Rev. 90, 259(1953).

Pr^{145} 59 86
No 4.5^hPr activity U(n,f) chem
Previously reported activity due to 3.7^hLa impurity?
A.A.Caretto, Jr., S.Katcoff, Phys. Rev. 89, 1267 (1953).

Pr^{146} 59 87
τ 24.4^m d 13.9^mCe U(n,f) chem
β^- 3.8 a
A.A.Caretto, Jr., S.Katcoff, Phys. Rev. 89, 1267 (1953).

Nd^{147} 60 87
γ (0.092) $\tau = 2.44 \times 10^{-9s}$
$\alpha_K = 1.8$ K:L:M=29:4:1
R.L.Graham, R.E.Bell, Can. J. Phys. 31, 377(1953).

Sm
Neutron resonances (ev)* $E_n = 0.1$ev to 40ev
3.43** 19
12 ? 22
15.2
*Isotopic assignment uncertain
**Not Sm 149, 152, or 154
V.L.Sailor, H.L.Foote, Jr., H.H.Landon, Phys. Rev. 89, 904A(1953); priv. comm.

Sm^{149} 62 87
Neutron resonances (ev) $E_n = 0.1$ev to 40ev
0.094
0.87
4.95
V.L.Sailor, H.L.Foote, Jr., H.H.Landon, Phys. Rev. 89, 904A(1953); priv. comm.

Sm^{152} 62 90
Neutron resonance (ev) $E_n = 0.1$ev to 40ev
8.20
V.L.Sailor, H.L.Foote, Jr., H.H.Landon, Phys. Rev. 89, 904A(1953); priv. comm.

Eu^{152} 63 89 5.3^y
τ_2 $12.4^y \pm 0.4$ Eu(pile n)
Counted for 1.1 years with β electroscope
E.E.Lockett, R.H.Thomas, Nucleonics 11, No. 3, 14(1953).

τ_2 $15.6^y \pm 1.5$ Eu(pile n)
Counted for 200 days with ic
J.Kastner, Can. J. Phys. 31, 169(1953).

$Eu^{152,154}$ 63
γ 1.40 sπ pe$^-$
L.Y.Shavtvalov, Zhur. Ekspt'l i Teoret. Fiz. 23, 611(1952).

Gd^{148} ? 64 84
τ $> 35^y$ Sm^{147}(32-Mev d) Eu(32-Mev p);
α >25%* 3.2 ion chem yield; ic
No 7^h activity found Sm(30-Mev α) ion chem
(7.5^hAt from Bi impurity?)
*Assuming σ(36-Mev α,3n) = 1
J.O.Rasmussen, Jr., S.G.Thompson, A.Ghiorso, Phys. Rev. 89, 33(1953).

Gd^{149} 64 84
ϵ Sm^{147}(31-Mev α) not Sm(19-Mev d),
α ~0.0007% 3.0 ion chem; ic
J.O.Rasmussen, Jr., S.G.Thompson, A.Ghiorso, Phys. Rev. 89, 33(1953).

Gd^{150} ? 64 86
α 2.7 Eu(19-Mev d) chem; ic
J.O.Rasmussen, Jr., S.G.Thompson, A.Ghiorso, Phys. Rev. 89, 33(1953).

Tb^{149} 65 84
τ 4.1^h Eu(60-Mev α)
ϵ ? Gd(31-Mev p); ion chem
α 3.95
No β^+
J.O.Rasmussen, Jr., S.G.Thompson, A.Ghiorso, Phys. Rev. 89, 33(1953).

Tb^{151} ? 65 86
τ 19^h Gd(100-Mev p) Eu(45-Mev α)
α >0.0004%* 3.4 ion chem; ic
J.O.Rasmussen, Jr., S.G.Thompson, A.Ghiorso, Phys. Rev. 89, 33(1953); *M.A.Rollier, J.O.Rasmussen, ibid.

$Dy^{\geq 149, \leq 153}$ 66
τ 19^m Tb(100-Mev p)
α 4.1 not Eu(120-Mev α); ic

τ 2.3^h Tb(100-Mev p); ion chem
α 3.6 Nd(~100-Mev C^{12}); ic

τ 7^m Tb(100-Mev p)
α 4.2 Nd(~100-Mev C^{12}); ic
Not Eu(120-Mev α)
J.O.Rasmussen, Jr., S.G.Thompson, A.Ghiorso, Phys. Rev. 89, 33(1953).

Ho ?
τ $\sim 4^m$ Dy(200-Mev p)
α 4.2 Sm(100-Mev C^{12})? ic
No Ho α activity observed with $\tau > 1^h$
Er(200-Mev p) Yb(250-Mev p); ion chem
J.O.Rasmussen, Jr., S.G.Thompson, A.Ghiorso, Phys. Rev. 89, 33(1953).

Er No Er α activity observed with $\tau > 1^h$
Er(200-Mev p) Yb(250-Mev p); ion chem

J.O.Rasmussen, Jr., S.G.Thompson, A.Ghiorso, Phys. Rev. 89, 33(1953).

Tm No Tm α activity observed with $\tau > 1^h$
Er(200-Mev p) Yb(250-Mev p); ion chem

J.O.Rasmussen, Jr., S.G.Thompson, A.Ghiorso, Phys. Rev. 89, 33(1953).

Yb Neutron resonances (ev) E_n = 0.1 ev to 40 ev

0.597	13.3
4.55	18.2
8.09	30

V.L.Sailor, H.L.Foote, Jr., H.H.Landon, Phys. Rev. 89, 904A(1953).

Lu^{176} 71 105 $2.4 \times 10^{10 y}$

τ_{β^-} $2.0 \times 10^{10 y}$ 92 β's/sec/g Lu*
200 γ's/sec/g Lu
β^- ~0.4 a
γ 100 † 0.20 scin
100 † 0.32
(0.32γ) (0.20γ) (0.4β) (γ)
No 0.52γ (< 10%) 0.090γ not observed
x ray/disintegration ~0.35
accounted for by γ conversion

J.R.Arnold, T.Sugihara, Phys. Rev. 90, 332(1953); *A.D.Suttle, Jr., ibid.

Lu^{177} 71 106

(0.206γ) (0.112γ) b = −0.20
I = 5/2, 7/2, 3/2 (E)1, (E)2

T.Wiedling, Arkiv Fysik 6, 39(1953).

Hf^{181} 72 109

γ (0.48) $\tau = 1.04 \times 10^{-8 s}$ (ce⁻)(γ)

T.C.Engelder, Phys. Rev. 90, 259(1953).

γ (0.34), (0.48) $\tau = 1.06 \times 10^{-8 s}$ $\gamma\gamma$

H. deWaard, Physica 18, 1151(1952).

~$10^{\mu s}$ level produced by Ta(γ,γ') $E_\gamma \leq 6.5$ scin

H.N.Brown, R.A.Becker, Phys. Rev. 90, 328(1953).

W^{185} 74 111

γ (0.13) $\tau < 2 \times 10^{-9 s}$ $\beta\gamma$

T.C.Engelder, Phys. Rev. 90, 259(1953).

W^{187} 74 113

τ 23.85^h W(slow n)

G.G.Eichholz, Phys. Rev. 89, 525(1953).

τ 24.0^h W^{186}(pile n,γ)
β^-* 80% 0.622 s $\pi\sqrt{2}$
20% 1.304

W^{187} 74 113

γ	K/L		K/L
0.072		0.513	
0.106		0.552 ?	
0.114		0.619	4
0.134	5.5	0.626	
0.206		0.686	5
0.239		0.774	
0.246		0.866	
0.480	4.2		

L_I/L_{III} ~60 for 0.134γ

J.M.Cork, M.K.Brice, W.H.Nester, J.M.LeBlanc, D.W.Martin, Phys. Rev. 89, 1291(1953); *A.E. Stoddard, ibid.

Re^{185} 75 110

I 5/2 Mic
q(Re^{185})/q(Re^{187}) = 1.06

A.Javan, G.Silvey, C.H.Townes, A.V.Grosse, BAPS 28, 2, J8(1953).

Re^{187} 75 112

I 5/2 Mic
q (Re^{185})/q(Re^{187}) = 1.06

A.Javan, G.Silvey, C.H.Townes, A.V.Grosse, BAPS 28, 2, J8(1953).

β^- ~0.034 ppl

B.Gauthe, J.M.Blum, Compt. rend. 236, 1255(1953).

β^- ~0.40* 3^{rd} forbidden ? pc
No x ray or γ
Spectral shape similar to Rb^{87}
β counts less than background

D.Dixon, McNair, quoted by S.C.Curran, Physica 18, 1161(1952); Nature 170, 512(1952).
*Decimal point as assigned in these references.

Re^{188} 75 113 2^{m}

τ_1 18.7^m Re(slow n)
γ 0.06 α~2 a
p 18^hRe* Szilard - Chalmers chem

A.Flammersfeld, Z. Naturf. 8a, 217(1953); *W.Herr, Z. Naturf. 7a, 819(1952).

τ_1 22^m Re^{187}(pile n)
γ 0.0635 s ce⁻
0.105
$\gamma\gamma$ (Re x ray + 0.06γ)/(0.105γ) ≥ 10 scin

J.W.Mihelich, Phys. Rev. 89, 907A(1953).

18^h γ 0.153 sl
0.485
0.645
1.4
(0.65γ) (1.4γ)

C.C.Mullen, H.E.Petch, M.W.Johns, Proc. Roy. Soc. Canada 44, 194A(1950).

$Os^{185}_{76\ 109}$ γ 0.163 s ce⁻
0.234
0.645 K/L~6
0.879

J.M.Cork, J.M.LeBlanc, W.H.Nester, D.W.Martin, M.K.Brice, Phys. Rev. 90, 444(1953).

$Os^{193}_{76\ 117}$ γ 0.073 L_I/L_{II}~1 0.404 s ce⁻
0.106 L/M~3 0.460
0.139 K/L~5 0.558
0.251
0.281 K/L~10
0.321 K/L~8

J.M.Cork, J.M.LeBlanc, W.H.Nester, D.W.Martin, M.K.Brice, Phys. Rev. 90, 444(1953).

$Ir^{192}_{77\ 115}$ 70ᵈ β^- 16% 0.24 s
40% 0.54
44% 0.67
No 0.84β^- (<0.4%)

		K*	L*	M*
γ	0.137		~1.8	
	0.202	~0.65		
	0.207	4.3	4.0	1.2
	0.296	16	7.4	
	0.309	15	6.7	
	0.317	34	18	5.5
	0.401	~0.1		
	0.420	~0.1		
	0.440	~0.05		
	0.468	7.7	2.2	0.64
	0.488	0.50		
	0.590	0.45	0.07	
	0.605	1.4	0.25	
	0.613	0.56	0.10	
	0.880	4.4**	1.1**	~0.5**

*(ce⁻/β) x 10^{-3} **(ce⁻/β) x 10^{-6}

A.A.Bashilov, N.M.Anton'eva, B.S.Dzhelepov, Izvest. Akad. Nauk Ser. Fiz. SSSR 16, 264(1952).

$Ir^{194}_{77\ 117}$ γ 100† 0.33 scin
100† 1.48 (E)2 98% (M)1 2%
1† {1.8, 2.1}
(1.48γ) (0.33γ) (θ) I = 2,2,0

J.J.Kraushaar, M.Goldhaber, Phys. Rev. 89, 1081 (1953).

$Pt^{191}_{78\ 113}$ τ 3.2ᵈ Ir(10-Mev d) chem, not Pt($\leqslant$22-Mev γ)

γ 0.062	0.129	0.350	sπ ce⁻
0.082	0.171	0.359	
0.094	0.178	0.408	
0.125	0.267	0.455	
No 0.042γ		0.537	

J.B.Swan, W.M.Portnoy, R.D.Hill, Phys. Rev. 89, 907A; 90, 257(1953).

$Pt^{193}_{78\ 115}$ 4.3ᵈ τ_1 4.5ᵈ Ir(10-Mev d) chem
Pt($\leqslant$22-Mev γ)
γ IT 0.135 M4 sπ
$K : L_I : L_{III} : M : N$ = 10 : 12 : 24 : 13 : 6

J.B.Swan, W.M.Portnoy, R.D.Hill, Phys. Rev. 89, 907A; 90, 257(1953).

$Pt^{193}_{78\ 115}$ g.s. τ_2 >74ᵈ or <1ʰ
Measurements outside these limits obscured by 72ᵈIr and 80ᵐPt

J.B.Swan, W.M.Portnoy, R.D.Hill, Phys. Rev. 90, 257(1953).

$Au^{\geqslant 183, \leqslant 187}_{79}$ τ 4.3ᵐ Pt(120-Mev p); chem
α 5.1 ic

J.O.Rasmussen, Jr., S.G.Thompson, A.Ghiorso, Phys. Rev. 89, 33(1953).

$Au^{195}_{79\ 116}$ 30ˢ γ 0.057 d 38ʰHg; s$\pi\sqrt{2}$
0.262

K.Gopalakrishnan, A.de-Shalit, J.W.Mihelich, Phys. Rev. 89, 908A(1953).

$Au^{196}_{79\ 117}$ 5.6ᵈ γ (0.33) (E)2 95% (M)1 5% $\gamma\gamma(\theta)$
(0.36) (E)2 $\gamma\gamma(\theta)$
$\gamma\gamma(\theta)$ I = 2,2,0
No crossover γ (<1%) scin
$\gamma\gamma(\theta)$ independent of phase and chemical structure

R.M.Steffen, Phys. Rev. 89, 665(1953); 89, 903A (1953).

$Au^{198}_{79\ 119}$ τ 2.697ᵈ ± 0.003 Au(pile n)
Counted for 10 days β electroscope

E.E.Lockett, R.H.Thomas, Nucleonics 11, No. 3, 14(1953).

γ (0.68) (E)2 60% (M)1 40% $\gamma\gamma(\theta)$
(0.68γ) (0.41γ) (θ) I = 2,2,0

C.D.Schrader, E.B.Nelson, J.A.Jacobs, Phys. Rev. 90, 159(1953).

No ϵ_K (<0.5%) sl
from absence of Pt Auger e⁻

C.D.Broyles, D.A.Thomas, S.K.Haynes, Phys. Rev. 89, 715(1953).

$Hg^{193}_{80\ 113}$ 10ʰ γ 0.039 Au(p)chem; s$\pi\sqrt{2}$ ce⁻(Hg)
0.102
0.032 s$\pi\sqrt{2}$ ce⁻(Au)
0.120
0.258

K.Gopalakrishnan, A.de-Shalit, J.W.Mihelich, Phys. Rev. 89, 908A(1953).

29ʰ τ_2 27ʰ Au(p) chem

K.Gopalakrishnan, A.de-Shalit, J.W.Mihelich, Phys. Rev. 89, 908A(1953).

$Hg^{195}_{80\ 115}$ 38ʰ γ 0.037 Au(p) chem; s$\pi\sqrt{2}$ ce⁻
0.123

K.Gopalakrishnan, A.de-Shalit, J.W.Mihelich, Phys. Rev. 89, 908A(1953).

$Hg^{203}_{80\ 123}$ γ (0.28) $\tau < 2 \times 10^{-9}$ ˢ $\beta\gamma$

T.C.Engelder, Phys. Rev. 90, 259(1953).

$Tl^{204}_{81\ 123}$ τ $2.71^y \pm 0.05$ Tl(pile n)
Counted for 8 months β electroscope

E.E.Lockett, R.H.Thomas, Nucleonics 11, No. 3, 14(1953).

$Tl^{206}_{81\ 125}$ τ $4.19^m \pm 0.02$ Tl(pile n)
Counted for 25 half-lives β electroscope

B.W.Sargent, L.Yaffe, A.P.Gray, Can. J. Phys. 31, 235(1953).

$Tl^{207}_{81\ 126}$ τ $4.79^m \pm 0.02$ Bi^{211} recoil
Counted for 25 half-lives β electroscope

B.W.Sargent, L.Yaffe, A.P.Gray, Can. J. Phys. 31, 235(1953).

$Tl^{208}_{81\ 127}$ $(0.58\gamma)(2.62\gamma)$ polarization-direction
$I = 4+,\ 2+,\ 0+$

J.J.Kraushaar, M.Goldhaber, Phys. Rev. 89, 1081 (1953).

$Pb^{200}_{82\ 118}$ γ 0.139 Tl(60-Mev d) chem
0.320 $s\pi\sqrt{2}$ ce^-

G.D.O'Kelley, UCRL-1243(1951).

$Pb^{203}_{82\ 121}$ γ 0.153 Tl(60-Mev d) chem
0.269 K/L = 2.3 $s\pi\sqrt{2}$ ce^-
0.424

G.D.O'Kelley, UCRL-1243(1951).

$Pb^{205}_{82\ 123}$ Levels Pb^{206}(d,t) $E_d = 14$ a pc
0.3
0.8
1.8

J.A.Harvey, Can. J. Phys. 31, 278(1953).

$Pb^{206}_{82\ 124}$ Levels Pb^{207}(d,t) $E_d = 14$ a pc
0.9 2.2
1.4 3.0
1.7

J.A.Harvey, Can. J. Phys. 31, 278(1953).

$Pb^{207}_{82\ 125}$ Levels

Pb^{206}(d,p)	Pb^{208}(d,t)
0.6	0.6
1.0	1.0
2.8	1.6
3.6	2.3
4.4	
4.7	
5.3	

$E_d = 14$ a pc

J.A.Harvey, Can. J. Phys. 31, 278(1953).

$Pb^{208}_{82\ 126}$ Levels Pb^{207}(d,p) $E_d = 14$ a pc
3.4 5.4
3.6 6.1
5.1

J.A.Harvey, Can. J. Phys. 31, 278(1953).

$Pb^{209}_{82\ 127}$ Levels Pb^{208}(d,p) $E_d = 14$ a pc
0.8 2.0
1.6 2.5

J.A.Harvey, Can. J. Phys. 31, 278(1953).

$Pb^{210}_{82\ 128}$ β^- 0.015 pc
No 0.0078γ (Cu x ray ?)

A.A.Jaffe, S.G.Cohen, Phys. Rev. 89, 454(1953).

β^- 0.024 pc
F-K plot linear to 8.5 kev

E.Huster, Naturwiss. 40, 197(1953).

γ (0.047) L : M : N = 100 : 23 : 6 EA
ce^- 0.0110 not assigned
No ce^-(0.014-0.030) < 1% of $ce^-_L(0.047\gamma)$

Y.Kobayaski, G.Miyamoto, J. Phys. Soc. Japan 8, 135(1953); 273(1953).

(L x ray) / (0.047γ) = 6.3 pc
Peaks seen ascribed to nuclear γ's of
16.1, 24, 30.7, 37.0, 41.5, 62.5 kev

P.E.Damon, R.R.Edwards, Phys. Rev. 90, 280(1953).

$Pb^{212}_{82\ 130}$ γ 0.23863 s
$H\rho(F)$ = 1388.56 ± 0.21
H determined (2-20 kev) with e^- accelerated through known potential.

D.I.Meyer, F.H.Schmidt, Phys. Rev. 89, 908A (1953).

γ (0.238) $\tau < 2 \times 10^{-11s}$ βe^-_K

R.L.Graham, R.E.Bell, Can. J. Phys. 31, 377(1953).

$Pb^{214}_{82\ 132}$ β^- 0.35 ? s βe^-
33 † 0.67
100 † ~0.73
γ 4.3* 0.241 s ce^-
4.8* 0.294
3.5* 0.350
$[0.67\beta]\ [e_K(0.35\gamma)]$
$[0.73\beta]\ [e_K(0.29\gamma)]$
*ce^- per 100 β^-

E.E.Berlovich, Izvest. Akad. Nauk Ser. Fiz. SSSR 16, 314(1952).

$Bi^{208}_{83\ 125}$ Bi(d,t) $E_d = 14$ a pc
Q values -1.17
-1.8
-2.2

J.A.Harvey, Can. J. Phys. 31, 278(1953).

$Bi^{209}_{83\ 126}$ μ 4.0400 $Bi(NO_3)_3$, D_2O; I
$\nu(Bi^{209})/\nu(D) = 1.04684 \pm 0.00005$

Y.Ting, D.Williams, Phys. Rev. 89, 595(1953).

Bi^{210} 83 127 4.9^d

τ_2 $4.989^d \pm 0.013$ Bi(pile n)
Counted for 33 days β electroscope

E.E.Lockett, R.H.Thomas, Nucleonics 11, No. 3, 14(1953).

No 0.080γ ($<0.02\%$ of β's) scin

D.G.E.Martin, G.Parry, Phil. Mag. 44, 344(1953).

Continuous γ spectrum scin
$\gamma(E_\gamma > 0.09)/\beta^- = 0.00084$

P.Bolgiano, L.Madansky, F.Rasetti, Phys. Rev. 89, 679(1953).

Bi(d,p) $E_d = 15$ scin
Q value 1.94
No higher energy p group ($<3\%$ of Q=1.94 group) but believed not g.s. Q

N.S.Wall, BAPS 28, 3, UA2(1953).

Bi(d,p) $E_d = 14$ a pc
Q values 1.94 -0.3
0.30 -0.8

J.A.Harvey, Can. J. Phys. 31, 278(1953).

Bi^{212} 83 129

α 6.051* s
6.090
*Value of 6.046 (Nature 167, 682) in error

E.R.Collins, C.D.McKenzie, C.A.Ramm, Proc. Roy. Soc. 216A, 219(1953).

γ (0.040) $\tau < 7 \times 10^{-11s}$ αe_L

R.L.Graham, R.E.Bell, Can. J. Phys. 31, 377(1953).

Bi^{214} 83 131

β^- 81% ~1.55 Ra^{226} source $a\beta\gamma$
<10% (2.56) a
19% (3.17) a
$E_{dis} = 3.17$

A.H.Wapstra, Physica 18, 1247(1952).

γ 0.605 1.379 $s\pi$ Cpt line
0.699* 1.504* 1.832*
0.770 1.627** 2.116**
0.907 1.679** (2.193)
(1.120) 1.727** 2.42**
1.247 (1.761)
( ) Used as standards
* ce_K^- seen by Ellis but assigned otherwise
** ce^- seen by Ellis but not assigned

M.Mladjenović, A.Hedgran, Physica 18, 1242(1952).

γ 1.1205 $s\pi$ ce_K^-
1.4158
$H_\rho = 4939.8 \pm 0.8$, 5874.4 ± 0.6 gauss cm

G.Lindström, A.Hedgran, D.E.Alburger, Phys. Rev. 89, 1303(1953).

Bi^{215} 83 132

τ 8^m d $0.9^m At^{219}$ p $2^{ms} Po^{215}$

E.K.Hyde, A.Ghiorso, Phys. Rev. 90, 267(1953).

Po^{206} 84 122

α 5% d $2.3^h Rn^{210}$

F.F.Momyer, UCRL-2060(1953).

Po^{210} 84 126

τ $138.39^d \pm 0.14$
Observed for 200 days calorimeter

D.C.Ginnings, A.F.Ball, D.T.Vier, J. Research Nat. Bur. Standards 50, 75(1953); J. Franklin Inst. 255, 241(1953).

Po^{212} 84 128

τ 2.9×10^{-7s} $\beta\gamma$

T.Hayaski, Y.Ishizaki, I.Kumabe, J. Phys. Soc. Japan 8, 110(1953).

Po^{218} 84 134

α 5.996 s

G.Bastin-Scoffier, J. Sant'ana-Dionisio, Compt. rend. 236, 1016(1953).

At^{211} 85 126

α 5.862

R.W.Hoff, F.Asaro, quoted by F.F.Momyer, UCRL-2060(1953).

At^{219} 85 134

τ 0.9^m d $21^m Fr^{223}$ chem
α 6.27 ic
$\alpha/\beta^- = 30$

E.K.Hyde, A.Ghiorso, Phys. Rev. 90, 267(1953).

Rn^{208} 86 122

τ 23^m p $4^h Po^{204}$ Th(340-Mev p)
ϵ ~80%
α ~20% 6.138 s

F.F.Momyer, UCRL-2060(1953).

Rn^{209} 86 123

τ 30^m p $5.7^h At^{209}$ Th(340-Mev p)
ϵ ~85%
α ~15% 6.04 s

F.F.Momyer, UCRL-2060(1953).

Rn^{210} 86 124

τ 2.7^h p $9^d Po^{206}$ Th(340-Mev p)
ϵ <5%
α >95% 6.036 s

F.F.Momyer, UCRL-2060(1953).

Rn^{211} 86 125

τ 16^h Th(340-Mev p)
ϵ 74%
α 17% 5.778 s
9% 5.847
γ 0.07 scin
0.15
0.40
0.60

F.F.Momyer, UCRL-2060(1953).

Rn^{212} 86 126

α 6.262 Th(340-Mev p) s

F.F.Momyer, UCRL-2060(1953).

Rn^{220} 86 134

α 6.278 s

G.Bastin-Scoffier, J.Sant'ana-Dionisio, Compt. rend. 236, 1016(1953).

$_{86}Rn^{221}_{135}$

τ 25^{m} Th(110-Mev p)
β^- ~80%
α ~20%

F.F.Momyer, UCRL-2060(1953).

$_{86}Rn^{222}_{136}$

α 5.482 s

G.Bastin-Scoffier, J.Sant'ana-Dionisio, Compt. rend. 236, 1016(1953).

$_{87}Fr^{212}_{125}$

α 24% 6.339 s
39% 6.387
37% 6.409

E.K.Hyde, F.Asaro, quoted by F.F.Momyer, UCRL-2060(1953).

$_{87}Fr^{223}_{136}$

α/β^- ~4×10^{-5}

E.K.Hyde, A.Ghiorso, Phys. Rev. 90, 267(1953).

$_{88}Ra^{213}_{125}$

τ 2.7^{m} p 30^{m}Rn^{209} Pb(C^{12})
α 6.90 ic

F.F.Momyer, UCRL-2060(1953).

$_{88}Ra^{224}_{136}$

α 5.679 s

G.Bastin-Scoffier, J.Sant'ana-Dionisio, Compt. rend. 236, 1016(1953).

$_{88}Ra^{226}_{138}$

α 4.777 ±0.004 s
Based on E_{α}(Po) = 5.299

G.Bastin-Scoffier, J.Sant'ana-Dionisio, Compt. rend. 236, 1016(1953).

$_{89}Ac^{228}_{139}$

β^- 2.18 $s\pi\surd 2$
γ 0.0568 $\tau > 0.01^{s}$
E_{dis} = 2.24
At least 6 lower energy β spectra observed

J.Kyles, C.G.Campbell, W. J. Henderson, quoted by N.Feather, Physica 18, 1241(1952).

$_{90}Th^{228}_{138}$

(α) (0.083γ) (θ) does not agree with I = 0, I, 0
τ(0.083γ) < 10^{-8s} Source Th(OH)$_4$
No (0.0868γ) (α) No $\gamma\gamma$

J.Battey, L.Madansky, F.Rasetti, Phys. Rev. 89, 182(1953).

$_{91}Pa^{231}_{140}$

γ 0.0273	α < 10	E1	a
0.0336		ce$^-$, ppl	
0.0380	$\left.\right\}$		
0.0569	$L_I + L_{II} \simeq L_{III}$	E2	
0.0635			
0.0823	$L_I \simeq M_I$		
	Rel. intensity of ce$^-$		
0.102	L_{II} : L_{III} : M = 2 : 2 : 2		
0.198	K : L = 2 : 5		
0.259	K : L = 10 : 5		
0.301	K : L : M = 100 : 20 : 7		
	α_K ~1.6	M1	
0.331	K : L : M = 50 : 10 : 1		
	α_K ~1.6	M1	
0.357	K : L = 10 : 2		
0.383	K = 5		

Unassigned ce$^-$ 0.125, 0.135, 0.170

P.Falk-Vairant, M.Riou, J. Phys. Radium 14, 65 (1953); P. Falk-Vairant, Compt. rend. 235, 796 (1952).

U

Neutron resonances (ev) E_n = 3.7 to 800 ev
6.6 σ_0 = 5000 Γ = 0.05
20 $\sigma_0\Gamma^2$ = 4.5
38 $\sigma_0\Gamma^2$ = 6.5

E.Hellstrand, R.Persson, Arkiv Fysik 6, 57(1953).

$_{92}U^{237}_{145}$

τ 6.75^{d} U^{236}(pile n) chem
β^- < 20% (0.080) sl, scin $\beta\gamma$
> 80% 0.25
γ 0.027
0.043 sl ce$^-$
37† 0.059
0.165 K/L$_1$ < 0.2
21† 0.207 K/L$_1$ = 4.8
0.269
2.5† 0.334
0.370
0.430
(0.21γ)(0.027γ) (0.21γ)(0.06γ) (0.21γ)(0.17γ)
(0.25β) (0.21γ)
No (0.33γ) (γ) No 0.51β (< 0.1%)
No photon with E_{γ} > 0.34 (< 10% of 0.33γ)

F.Wagner, Jr., M.S.Freedman, D.W.Engelkemeir, J.R.Huizenga, Phys. Rev. 89, 502(1953).

$_{93}Np^{234}_{141}$

γ 0.177 U^{235}(14-Mev d) chem
0.442 $s\pi\surd 2$ ce$^-$
0.803
1.42

G.D.O'Kelley, UCRL-1243(1951).

$_{94}Pu^{238}_{144}$

τ 89.6^{y}

A.H.Jaffey, J.Lerner, ANL-4411(1950).

γ 0.0451 $s\pi\surd 2$ ce$^-$
vw 0.048 ?
Pu from long n irradiation of Am^{241}

G.D.O'Kelley, UCRL-1243(1951).

$_{94}Pu^{241}_{147}$

τ_{β^-} 13.0^{y}
From Am^{241} present 2.39 years after initial purification

D.R.MacKenzie, M.Lounsbury, A.W.Boyd, Phys. Rev. 90, 327(1953).

$_{94}Pu^{243}_{149}$

τ 4.98^{h} Pu^{242}(pile n) ion chem
β^- 12% (~0.37)
35% 0.468 scin
53% 0.57
γ 0.085 $\alpha_L \leq 0.7$ scin
~0.1 α_L > 10
(0.47β)(0.085γ) (0.085γ)(~0.1γ) (0.085γ)(L x rays)
No (0.57β^-) (0.085γ) No (0.57β^-) (L x rays)

D.W.Engelkemeir, P.R.Fields, J.R.Huizenga, Phys. Rev. 90, 6(1953).

Am^{241} I 5/2 S
95 146
Large Q indicated

M. Fred, F. S. Thomkins, Phys. Rev. 89, 318(1953).

γ 0.059 s$\pi\sqrt{2}$ ce$^-$
$[e_L^-(0.059\gamma)]/\alpha = 0.28$

G. D. O'Kelley, UCRL-1243(1951).

No 0.0334γ, 0.0380γ (<0.1% of 0.0597γ) pc
Suggest lines seen* at 0.014, 0.019, 0.022 due to Am x rays, those at 0.033, 0.038 to La x rays

J. O. Newton, B. Rose, Phys. Rev. 89, 1157(1953).
*C. I. Browne, UCRL-1764(1952); F. Asaro, et al., Phys. Rev. 87, 277(1952).

Am^{242}
95 147
16^h

β^-	70%	0.628		s$\pi\sqrt{2}$	
ϵ	15%		Am^{241}(pile n)	chem	
γ I.T.	15%	0.035	$\alpha = 0.25$	s$\pi\sqrt{2}$	Am ce$^-$
		0.038	$\alpha = 0.25$		Pu ce$^-$
		0.053	$\alpha = 0.67$		Cm ce$^-$

L_{III}/L_{II} x ray ratios: Am 4.9, Pu 1.3, Cm 1.0 cryst

No γ with $E_\gamma > 0.06$ a

G. D. O'Kelley, UCRL-1243(1951).

100^y

β^-	0.593	Am^{241}(pile n)	chem
γ	0.038	s$\pi\sqrt{2}$	Pu ce$^-$
	0.053		Cm ce$^-$

G. D. O'Kelley, UCRL-1243(1951).

Cm^{242}
96 146

γ 0.043 $\alpha_L = 0.8$ s$\pi\sqrt{2}$ ce$^-$

G. D. O'Kelley, UCRL-1243(1951).

NEUTRON CROSS SECTIONS

Neutron Cross Sections

Reaction	σ Type	Value	Energy	Ref.
H(n)	σ_t	2.525	2.532	53f2
	σ_t	graph	3 - 13	53n1
	σ_t	1.690	4.75	53h3
	σ_t	0.057	126	53t2
Be(n)	σ_t	6.04	1ev-5kev	52h5
	σ_t	graph	3 - 13	53n1
C(n)	σ_t	graph	3 - 13	53n1
	σ_t	graph	30-139	53t2
N(n)	σ_t	graph	1.7 - 4	52j2
N^{14}(n,2n)	$\sigma(10^mN)$	5.7 mb	14.5	53p1
O(n)	σ_{el}	0.7	14.1	53c3
O(n,<14.1n)	σ_{in}	0.5	14.1	53c3
O(n)	σ_t	graph	3 - 13	53n1
	σ_t	1.6	14.1	53c3
O^{16}(n,p)	$\sigma(7.3^sN)$	49 mb	14.5	53p1

Neutron Cross Sections - Continued

Reaction	σ Type	Value	Energy	Ref.
F^{19}(n,2n)	$\sigma(1.9^hF)$	61 mb	14.5	53p1
F^{19}(n,p)	$\sigma(30^sO)$	130 mb	14.5	53p1
Na(n)	σ_t	2.98	1ev-1kev	52h5
	σ_t	graph	1ev-10kev	52h5
Na^{23}(n,p)	$\sigma(40^sNe)$	34 mb	14.5	53p1
Na^{23}(n,γ)	$\sigma(15.0^hNa)$	0.53	th	53b2
Mg^{24}(n,p)	$\sigma(15.0^hNa)$	190 mb	14.5	53p1
Mg^{25}(n,p)	$\sigma(62^sNa)$	45 mb	14.5	53p1
Al(n)	σ_t	graph	3 - 13	53n1
	σ_t	graph	30-139	53t2
Al^{27}(n,α)	$\sigma(15.0^hNa)$	79 mb	14.5	53p1
Al^{27}(n,p)	$\sigma(9.5^mMg)$	52 mb	14.5	53p1
Si(n)	σ_t	graph	3 - 13	53n1
Si^{28}(n,p)	$\sigma(2.4^mAl)$	220 mb	14.5	53p1
Si^{29}(n,p)	$\sigma(6.6^mAl)$	100 mb	14.5	53p1
Si^{30}(n,α)	$\sigma(9.5^mMg)$	46 mb	14.5	53p1
P(n)	σ_t	2.22	14	53a1
P^{31}(n,α)	$\sigma(2.4^mAl)$	0.15	14.5	53p1
P^{31}(n,p)	$\sigma(2.6^hSi)$	0.064	14.5	53p1
S(n)	σ_t	graph	3 - 13	53n1
	σ_t	2.06	14	53a1
S^{32}(n,p)	$\sigma(14.3^dP)$	0.37	14.5	53p1
S^{34}(n,α)	$\sigma(26^hSi)$	0.14	14.5	53p1
S^{34}(n,p)	$\sigma(12.4^sP)$	0.085	14.5	53p1
Cl^{35}(n,α)	$\sigma(14.3^dP)$	0.19	14.5	53p1
Cl^{35}(n,2n)	$\sigma(33^mCl)$	0.0035	14.5	53p1
Cl^{37}(n,α)	$\sigma(12.4^sP)$	0.052	14.5	53p1
Cl^{37}(n,p)	$\sigma(5.0^mS)$	0.033	14.5	53p1
K^{39}(n,2n)	$\sigma(7.5^mK)$	0.010	14.5	53p1
K^{41}(n,α)	$\sigma(38^mCl)$	0.031	14.5	53p1
K^{41}(n,p)	$\sigma(1.8^hA)$	0.081	14.5	53p1
Sc(n)	σ_a	23	th	53l1
	σ_a	25	th	52p3
Sc^{45}(n,γ)	$\sigma(85^dSc)$	22	th	53l2
Ti^{48}(n,p)	$\sigma(1.8^dSc)$	0.093	14.5	53p1
V(n)	σ_t	graph	0.02 - 5ev	53b4
V^{51}(n,α)	$\sigma(1.8^dSc)$	0.029	14.5	53p1
V^{51}(n,p)	$\sigma(6^mTi)$	0.027	14.5	53p1
Cr^{52}(n,p)	$\sigma(3.7^mV)$	0.078	14.5	53p1
Mn^{55}(n,α)	$\sigma(3.7^mV)$	0.052	14.5	53p1
Mn^{55}(n,γ)	$\sigma(2.6^hMn)$	12.7	th	53b2
Fe(n,n')	σ(all γ's)	4.6	14	53s2
	σ(~6.5Mev γ's)	~0.5	14	53b5
	σ(~2.5Mev γ's)	~2.4	14	53b5
Fe(n)	σ_t	graph	3 - 13	53n1

Neutron Cross Sections - Continued

Reaction	σ Type	Value	Energy	Ref.
$Fe^{56}(n,p)$	$\sigma(2.6^h Mn)$	0.097	14.5	53p1
$Fe^{56}(n,n')$	$\sigma(0.85\gamma)$	~0.4	1.23	53r1
Co(n)	σ_t	graph	0.1 - 3	53w2
$Co^{59}(n,\alpha)$	$\sigma(2.6^h Mn)$	0.039	14.5	53p1
$Ni^{58}(n,2n)$	$\sigma(36^h Ni)$	0.041	14.5	53p1
$Ni^{61}(n,p)$	$\sigma(1.7^h Co)$	0.18	14.5	53p1
Cu(n)	σ_t	graph	3 - 13	53n1
	σ_t	3.09	14	53a1
	σ_t	table	30 - 153	53t2
	σ_t	1.19	400	53n2
$Cu^{63}(n,2n)$	$\sigma(10^m Cu)$	0.48	14.5	53p1
	$\sigma(10^m Cu)$	graph	13 - 27	53b6
$Cu^{65}(n,2n)$	$\sigma(12.9^h Cu)$	1.10	14.5	53p1
$Zn^{64}(n,2n)$	$\sigma(38^m Zn)$	0.22	14.5	53p1
$Zn^{64}(n,p)$	$\sigma(12.9^h Cu)$	0.39	14.5	53p1
$Zn^{66}(n,p)$	$\sigma(5^m Cu)$	0.10	14.5	53p1
Ga(n)	σ_t	graph	0.1 - 3	53w2
$Ga^{69}(n,\alpha)$	$\sigma(5^m Cu)$	0.10	14.5	53p1
$Ga^{69}(n,2n)$	$\sigma(68^m Ga)$	0.55	14.5	53p1
$Ga^{69}(n,p)$	$\sigma(14^h Zn)$	0.024	14.5	53p1
$Ga^{71}(n,2n)$	$\sigma(20^m Ga)$	0.70	14.5	53p1
Ge(n)	σ_t	graph	0.4 - 3.5	52j2
$Ge^{70}(n,2n)$	$\sigma(40^h Ge)$	0.67	14.5	53p1
$Ge^{70}(n,p)$	$\sigma(20^m Ga)$	0.13	14.5	53p1
$Ge^{72}(n,p)$	$\sigma(14^h Ga)$	0.065	14.5	53p1
$Ge^{73}(n,p)$	$\sigma(5.0^h Ga)$	0.14	14.5	53p1
$Ge^{74}(n,\alpha)$	$\sigma(2.2^m Zn)$	0.015	14.5	53p1
$Ge^{76}(n,2n)$	$\sigma(82^m Ge)$	1.80	14.5	53p1
$As^{75}(n,\alpha)$	$\sigma(14^h Ga)$	0.012	14.5	53p1
$As^{75}(n,2n)$	$\sigma(17^d As)$	0.54	14.5	53p1
$As^{75}(n,p)$	$\sigma(82^m Ge)$	0.012	14.5	53p1
Se(n)	σ_t	graph	0.4 - 3.5	52j2
	σ_t	graph	0.1 - 3	53w2
$Se^{77}(n,p)$	$\sigma(40^h As)$	0.045	14.5	53p1
$Se^{80}(n,\alpha)$	$\sigma(59^s Ge)$	0.038	14.5	53p1
$Se^{82}(n,2n)$	$\sigma(59^m Se)$	1.5	14.5	53p1
$Br^{79}(n,2n)$	$\sigma(6.4^m Br)$	1.10	14.5	53p1
$Br^{81}(n,\alpha)$	$\sigma(90^m As)$	0.10	14.5	53p1
$Br^{81}(n,2n)$	$\sigma(4.4^h Br$	0.83	14.5	53p1
$Rb^{87}(n,\alpha)$	$\sigma(33^m Br)$	0.039	14.5	53p1
$Sr^{84}(n,\gamma)$	$\sigma(65^d Sr)$	1.2	th	53l2
$Sr^{88}(n,\alpha)$	$\sigma(4.4^h Kr)$	0.064	14.5	53p1
$Sr^{88}(n,p)$	$\sigma(17.8^m Rb)$	0.018	14.5	53p1
$Y^{89}(n,\alpha)$	$(19^d Rb)$	0.070	14.5	53p1
Zr(n)	σ_t	graph	3 - 13	53n1
$Zr^{90}(n,\alpha)$	$\sigma(2.8^h Sr)$	0.2	14.5	53p1
$Zr^{90}(n,2n)$	$\sigma(4.5^m Zr)$	0.08	14.5	53p1
$Zr^{90}(n,p)$	$\sigma(61^h Y)$	0.25	14.5	53p1
$Zr^{94}(n,p)$	$\sigma(16^m Y)$	0.01	14.5	53p1
$Mo^{92}(n,2n)$	$\sigma(15.5^m + 75^s Mo)$	0.19	14.5	53p1
	$\sigma(15.5^m Mo)$	graph	13 - 27	53b6
$Mo^{97}(n,p)$	$\sigma(76^m Nb)$	0.1	14.5	53p1
$Mo^{100}(n,2n)$	$\sigma(68^h Mo)$	3.8	14.5	53p1
$Ru^{96}(n,2n)$	$\sigma(1.6^h Ru)$	0.48	14.5	53p1
$Ru^{101}(n,p)$	$\sigma(15^m Tc)$	0.002	14.5	53p1
Rh(n)	σ_s	4.1	0.15 ev	53b4
$Pd^{104}(n,p)$	$\sigma(4.3^m + 44^s Rh)$	0.13	14.5	53p1
$Pd^{105}(n,p)$	$\sigma(36^h Rh)$	0.7	14.5	53p1
$Pd^{110}(n,\alpha)$	$\sigma(4^m Ru)$	0.014	14.5	53p1
$Pd^{110}(n,2n)$	$\sigma(13^h Pd)$	1.9	14.5	53p1
$Ag^{107}(n,2n)$	$\sigma(24.5^m Ag)$	0.5	14.5	53p1
$Ag^{109}(n,2n)$	$\sigma(2.3^m Ag)$	0.3	14.5	53p1
Cd(n,n')	$\sigma(49^m Cd)$	0.21	1.27	53f3
		graph	0.4 - 1.3	53f3
Cd(n)	σ_s/σ_a	graph	0.025 - 0.4 ev	53b4
	σ_t	[illegible]	0.175 ev	53b4
	σ_t	graph	0.1 - 3	53w2
	σ_t	graph	0.4 - 3.5	52j2
	σ_t	table	37 - 153	53t2
	σ_t	1.84	400	53n2
$Cd^{110}(n,\gamma)$	$\sigma(49^m Cd)$	< 0.001	0.2 - 0.4	53f3
$Sb^{121}(n,2n)$	$\sigma(16.6^m Sb)$	0.75	14.5	53p1
$Sb^{123}(n,2n)$	$\sigma(2.8^d Sb)$	1.2	14.5	53p1
Te(n)	σ_t	graph	0.1 - 3	53w2
$Te^{128}(n,2n)$	$\sigma(9.3^h Te)$	0.78	14.5	53p1
$Te^{130}(n,2n)$	$\sigma(72^m + 32^d Te)$	0.60	14.5	53p1
$I^{127}(n,\alpha)$	$\sigma(21^m Sb)$	0.018	14.5	53p1
$I^{127}(n,2n)$	$\sigma(13.0^d I)$	1.1	14.5	53p1
		graph	12 - 18	53m4
$I^{127}(n,p)$	$\sigma(9.3^h Te)$	0.23	14.5	53p1
$I^{127}(n,\gamma)$	$\sigma(25^m I)$	graph	0.25 - 1.6	53m4
$Ba^{138}(n,p)$	$\sigma(33^m Cs)$	0.006	14.5	53p1
$Ba^{138}(n,\gamma)$	$\sigma(58^m Ba)$	0.053	~25 kev	53k4
$La^{139}(n,p)$	$\sigma(85^m Ba)$	0.006	14.5	53p1

Neutron Cross Sections - Continued

Reaction	σ Type	Value	Energy	Ref.
$Ce^{140}(n,\alpha)$	$\sigma(2.6^{m}Ba)$	0.012	14.5	53p1
$Pr^{141}(n,2n)$	$\sigma(3.6^{m}Pr)$	2.1	14.5	53p1
$Sm^{152}(n,\alpha)$	$\sigma(1.7^{h}Nd)$	0.009	14.5	53p1
$Sm^{154}(n,2n)$	$\sigma(47^{h}Sm)$	0.22	14.5	53p1
$Sm_2O_3(n)$ Single level indicated	σ_s/σ_a	graph	0.025 - 0.16 ev	53b4
$Eu_2O_3(n)$	σ_s/σ_a	graph	0.025 - 0.16 ev	53b4
$Gd^{160}(n,2n)$	$\sigma(18.0^{h}Gd)$	1.5	14.5	53p1
$Gd_2O_3(n)$ Two levels indicated	σ_s/σ_a	graph	0.025 - 0.16 ev	53b4
$Dy_2O_3(n)$	σ_s/σ_a	graph	0.025 - 0.13 ev	53b4
Hf(n)	σ_{el}	4.7	1.0	53w3
$Ta^{181}(n,2n)$	$\sigma(8.0^{h}Ta)$	0.9	14.5	53p1
$W^{186}(n,\gamma)$	$\sigma(24^{h}W)$	0.12	25 kev	53k4
Pt(n)	σ_t	graph	0.1 - 3	53w2
$Pt^{198}(n,2n)$	$\sigma(18^{h}Pt)$	3	14.5	53p1
Au(n)	σ_t	graph	0.1 - 3	53w2
	σ_t	5.1	14	53a1
$Au^{197}(n,2n)$	$\sigma(5.6^{d}Au)$	1.7	14.5	53p1
Hg(n)	σ_t	graph	0.1 - 3	53w2
	σ_t	graph	0.4 - 3.5	52j2
	σ_t	5.3	14	53a1
$Tl^{205}(n,p)$	$\sigma(5.5^{m}Hg)$	0.003	14.5	53p1
Pb(n)	σ_{el}	4.6	1.0	53w3
Pb(n,n')	$\sigma(\sim3.5$ Mev γ's)	~0.3	14	53b5
	$\sigma(\sim2.5$ Mev γ's)	~4	14	53b5
Pb(n)	σ_t	graph	3 - 13	53n1
	σ_t	5.8	14	53a1
	σ_t	4.22	55	53r2
	σ_t	4.87	85	53r2
	σ_t	table	37 - 153	53t2
	σ_t	2.88	400	53n2
$Pb^{208}(n,p)$	$\sigma(3.1^{m}Tl)$	0.001	14.5	53p1
Bi(n)	σ_{el}	4.8	1.0	53w3
	σ_t	graph	3 - 13	53n1
	σ_t	5.4	14	53a1
$Bi^{209}(n,\alpha)$	$\sigma(4.2^{m}Tl)$	0.001	14.5	53p1
$Ac^{227}(n)$	σ_a	500	th	52p3
Th(n)	σ_t	graph	0.1 - 3	53w2
	σ_t	3.23	400	53n2

Neutron Cross Sections - Continued

Reaction	σ Type	Value	Energy	Ref.
$Th^{230}(n)$	σ_a	30 - 60	pile	49h1
$Pa^{230}(n)$	σ_a	~1500	pile	47g1
$Pa^{231}(n,\gamma\beta^-)$	$\sigma(70^{y}U)$	290	pile	53e3
$Pa^{232}(n,\gamma)$	$\sigma(27.4^{d}Pa)$	~40	pile	53e3
U(n)	σ_t	graph	3.7 - 800ev	53h5
	σ_t	graph	3 - 13	53n1
	σ_t	3.26	400	53n2
$U^{232}(n)$	σ_a	<500	pile	53e1
$U^{232}(n,f)$	σ_f	~80	th	53e1

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GROUND STATE Q'S

Reaction	Standard	Value	Method	Ref.
$Li^6(p,\alpha)He^3$	absolute	+ 4.023 ± 0.003	s	53c1
$Li^6(d,\alpha)He^4$	absolute	+22.396 ± 0.012	s	53c1
$Li^6(d,p)Li^7$	absolute	+ 5.028 ± 0.003	s	53c1
$Li^7(p,\alpha)He^4$	absolute	+17.352 ± 0.009	s	53c1
$Be^9(p,\alpha)Li^6$	absolute	+ 2.126 ± 0.003	s	53c1
$Be^9(d,\alpha)Li^7$	absolute	+ 7.153 ± 0.004	s	53c1
$Be^9(p,d)Be^8$	absolute	+ 0.560 ± 0.003	s	53c1
$Be^9(d,t)Be^8$		+ 4.60 ± 0.03	ppl	52c2
$B^{10}(n,\alpha)Li^7$	Po^{212} α	+ 2.781 ± 0.025	pc	52h7
$B^{10}(d,\alpha)Be^8$	Bi^{212} Po^{212} α	+ 17.91 ± 0.06	ic	53t3
$B^{11}(p,\alpha)Be^8$	absolute	+ 8.589 ± 0.005	s	53c1
$N^{14}(d,n)O^{15}$		+ 5.15 ± 0.16	ppl	53e2
$N^{14}(\alpha,p)O^{17}$		− 1.16	ppl	53h4
$N^{15}(p,\alpha)C^{12}$	absolute	+ 4.962 ± 0.004	s	53c1
$Na^{23}(p,\alpha)Ne^{20}$	$Li^7(p,n)$	+ 2.379 ± 0.003	EA	53d1
$Mg^{24}(p,\gamma)Al^{25}$	$F(p,\alpha)$	+ 2.32 ± 0.10	scin	53c2
$Mg^{24}(d,n)Al^{25}$		+ 0.07 ± 0.06	ppl	53g2
$Mg^{26}(p,\gamma)Al^{27}$	$F(p,\alpha)$	+ 8.3 ± 0.4	scin	53c2
$Al^{27}(p,\alpha)Mg^{24}$	$Li^7(p,n)$	+ 1.594 ± 0.002	EA	53d1
$Al^{27}(p,n)Si^{27}$	$F^{19}(p,\alpha\gamma)$	− 5.61 ± 0.01	thresh	53k1
$S^{32}(d,n)Cl^{33}$		+ 0.25 ± 0.07	ppl	53m2
$S^{32}(\alpha,p)Cl^{35}$		− 2.02 ± 0.11	ppl	52f2
Mass (S^{32})/Mass (S^{34})		1.06242	Mic	53b3
$Cl^{35}(n,\alpha)P^{32}$		+ 1.07 ± 0.15	ic	52f2
$Sc^{45}(n,\gamma)Sc^{46}$	absolute	+ 8.85 ± 0.08	pair s	53b1
$Ti^{47}(n,\gamma)Ti^{48}$	absolute	+ 9.39 + 2.31 ?	pair s	53k2
$Ti^{48}(n,\gamma)Ti^{49}$	absolute	+ 6.76 + 1.35 ?	pair s	53k2
$Ti^{49}(n,\gamma)Ti^{50}$	absolute	+ 9.19 + 1.58 ?	pair s	53k2
$V^{51}(n,\gamma)V^{52}$	absolute	+ 7.305 ± 0.007	pair s	53b1
$Cr^{52}(d,p)Cr^{53}$		+ 5.70	s	53m1
$Cr^{52}(n,\gamma)Cr^{53}$	absolute	+ 7.929 ± 0.008	s	53k2
$Cr^{53}(n,\gamma)Cr^{54}$	absolute	+ 9.716 ± 0.008	s	53k2
$Mn^{55}(n,\gamma)Mn^{56}$	absolute	+ 7.261 ± 0.006	pair s	53b1

Ground State Q's - Continued

Reaction	Standard	Value	Method	Ref.
$Fe^{54}(n,\gamma)Fe^{55}$	absolute	+ 9.298 ± 0.007	pair s	53k2
$Fe^{56}(n,\gamma)Fe^{57}$	absolute	+ 7.639 ± 0.004 (+0, 0.014, or 0.13)	pair s	53k2
$Fe^{57}(n,\gamma)Fe^{58}$	absolute	+10.16 ± 0.04	pair s	53k2
$Co^{59}(n,\gamma)Co^{60}$	absolute	+ 7.486 ± 0.009	pair s	53b1
$Ni^{58}(d,p)Ni^{59}$		+ 6.77	ppl	53m1
$Ni^{58}(n,\gamma)Ni^{59}$	absolute	+ 8.997 ± 0.005	pair s	53k2
$Ni^{60}(n,\gamma)Ni^{61}$	absolute	+ 8.532 ± 0.008	pair s	53k2
$Cu^{63}(n,\gamma)Cu^{64}$	absolute	+ 7.914 ± 0.004	pair s	53b1
$Cu^{65}(n,\gamma)Cu^{66}$	absolute	+ 7.634 ± 0.006? See Cu^{66}	pair s	53b1
$Zn^{65}(n,\gamma)Zn^{66}$	absolute	+ 7.876 ± 0.007	pair s	53k2
$Zn^{67}(n,\gamma)Zn^{68}$	absolute	+ 9.51 ± 0.03 ?	pair s	53k2
$Sr^{88}(d,p)Sr^{89}$		+ 4.33 ± 0.10	s	53m1
$Mo^{92}(\gamma,n)Mo^{91}$	- -	−13.1 ± 0.1	thresh	53k3
$Mo^{92}(n,2n)Mo^{91}$	- -	−12.34	thresh	53b6
$Pb^{206}(d,t)Pb^{205}$	$Al^{27}(d,p)$	− 1.8 ± 0.1	range	53h6
$Pb^{206}(d,p)Pb^{207}$	$Al^{27}(d,p)$	+ 4.48 ± 0.05	range	53h6
$Pb^{207}(d,t)Pb^{206}$	$Al^{27}(d,p)$	− 0.42 ± 0.05	range	53h6
$Pb^{207}(d,p)Pb^{208}$	$Al^{27}(d,p)$	+ 5.14 ± 0.05	range	53h6
$Pb^{208}(d,t)Pb^{207}$	$Al^{27}(d,p)$	− 1.10 ± 0.05	range	53h6
$Pb^{208}(d,p)Pb^{209}$	$Al^{27}(d,p)$	+ 1.65 ± 0.05	range	53h6

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PACKING FRACTION DIFFERENCES

Δf, in Units 10^{-4} amu

Doublet	Δf	Ref.
$H_2 - D$	$+7.746 \pm 0.004$	5301
$He^4 - D_2$	-64.01 ± 0.02	5301
$B^{10} - Ne^{20}$	$+16.722 \pm 0.008$	5301
$B^{10}H - B^{11}$	$+10.41 \pm 0.01$	5301
$B^{10}D - C^{12}$	$+22.51 \pm 0.02$	5301
$B^{10}F^{19} - C^{13}O^{16}$	$+4.500 \pm 0.005$	5301
$B^{10}HF^{19} - B^{11}F^{19}$	$+3.817 \pm 0.005$	5301
$B^{11} - Ne^{22}$	$+12.382 \pm 0.007$	5301
$B^{11}H - C^{12}$	$+14.262 \pm 0.005$	5301
$B^{11}F^{19} - Si^{30}$	$+11.316 \pm 0.007$	5301
$C^{12} - D_3$	$+70.50 \pm 0.02$	5301
$C^{12}H_4 - O^{16}$	$+22.759 \pm 0.005$	5301
$C_2^{12}H_4 - C^{12}O^{16}$	$+13.008 \pm 0.003$	5301
$C^{12}C^{13}H - C_2^{12}H_3$	-1.661 ± 0.004	5301
$C^{13}O^{16} - Si^{29}$	$+7.517 \pm 0.006$	5301
$C^{13}O^{16} - B^{10}F^{19}$	-4.500 ± 0.005	5301
$N^{14} - C^{12}H_2$	-8.989 ± 0.004	5301
$N_2^{14} - C_2^{12}H_4$	-8.986 ± 0.004	5301
$N_2^{14} - C^{12}O^{16}$	$+4.019 \pm 0.003$	5301
$N^{15} - C^{12}H_3$	-15.585 ± 0.004	5301
$H_2O^{18} - D_2O^{16}$	-4.15 ± 0.01	5301
$B^{10}F^{19} - C^{13}O^{16}$	$+4.500 \pm 0.005$	5301
$B^{11}F^{19} - Si^{30}$	$+11.316 \pm 0.007$	5301
$Ne^{20} - B^{10}$	-16.722 ± 0.008	5301
$Ne^{20} - D_2O^{16}$	-15.355 ± 0.006	5301
$Ne^{22} - B^{11}$	-12.382 ± 0.007	5301
$Al^{27} - C_2^{12}H_3$	-15.561 ± 0.007	5301
$Si^{28} - C^{12}O^{16}$	-6.435 ± 0.005	5301
$Si^{29} - C^{13}O^{16}$	-7.517 ± 0.006	5301
$Si^{30} - B^{11}F^{19}$	-11.316 ± 0.007	5301
$P^{31}H - S^{32}$	$+2.969 \pm 0.003$	5302
$P^{31}H_2 - S^{32}H$	$+2.876 \pm 0.004$	5302
$P^{31}H - O_2^{16}$	-2.577 ± 0.004	5302
$S^{32} - P^{31}H$	-2.969 ± 0.003	5302
$S^{32}H - P^{31}H_2$	-2.876 ± 0.004	5302
$S^{32} - O_2^{16}$	-5.539 ± 0.003	5301
$S^{32}H_2 - S^{34}$	$+5.837 \pm 0.006$	5301

Packing Fraction Differences, Δf, in Units 10^{-4} amu (continued)

Doublet	Δf	Ref.
$S^{32}O^{16} - C_4^{12}$	-6.900 ± 0.005	5301
$S^{33}H_2 - S^{34}H$	$+3.250 \pm 0.009$	5301
$S^{34}H_2 - C_3^{12}$	-4.596 ± 0.006	5301
$HCl^{35} - C_3^{12}$	-6.479 ± 0.003	5301
$Cl^{37} - C_3^{12}H$	-11.352 ± 0.004	5301
$HCl^{37} - C_3^{12}H_2$	-11.053 ± 0.004	5301
$A^{40} - D_2O^{16}$	-20.959 ± 0.007	5301
$A^{40} - C_3^{12}H_4$	-17.234 ± 0.007	5301
$Zr^{92} - W^{184}$	-7.59 ± 0.02	53g1
$Zr^{94} - Os^{188}$	-7.59 ± 0.01	53g1
$Zr^{96} - Os^{192}$	-7.48 ± 0.02	53g1
$Mo^{92} - W^{184}$	-7.44 ± 0.02	53g1
$Mo^{94} - Os^{188}$	-7.72 ± 0.02	53g1
$Mo^{96} - Os^{192}$	-7.86 ± 0.01	53g1
$Ru^{96} - Os^{192}$	-7.55 ± 0.02	53g1
$Ru^{102} - Pb^{204}$	-8.02 ± 0.03	52h7
$Ru^{104} - Pb^{208}$	-7.96 ± 0.01	52h7
$Rh^{103} - Pb^{206}$	-7.94 ± 0.01	52h7
$Pd^{102} - Pb^{204}$	-7.94 ± 0.04	52h7
$Pd^{104} - Pb^{208}$	-8.05 ± 0.01	52h7
$W^{184} - Zr^{92}$	$+7.59 \pm 0.02$	53g1
$W^{184} - Mo^{92}$	$+7.44 \pm 0.02$	53g1
$Os^{188} - Zr^{94}$	$+7.59 \pm 0.01$	53g1
$Os^{188} - Mo^{94}$	$+7.72 \pm 0.02$	53g1
$Os^{192} - Zr^{96}$	$+7.48 \pm 0.02$	53g1
$Os^{192} - Mo^{96}$	$+7.86 \pm 0.01$	53g1
$Os^{192} - Ru^{96}$	$+7.55 \pm 0.02$	53g1
$Pb^{204} - Ru^{102}$	$+8.02 \pm 0.03$	52h7
$Pb^{204} - Pd^{102}$	$+7.94 \pm 0.04$	52h7
$Pb^{206} - Rh^{103}$	$+7.94 \pm 0.01$	52h7
$Pb^{208} - Ru^{104}$	$+7.96 \pm 0.01$	52h7
$Pb^{208} - Pd^{104}$	$+8.05 \pm 0.01$	52h7

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